S. 15. B.

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SYSTEMATIC LISTS

ILLUSTRATIVE OF THE

Flora, Fauna, Palæontology,

AND

Archæology

OF THE

NORTH OF IRELAND.

BRITISH MUSEUM NATURAL HISTORY

BY MEMBERS OF

The Belfast Naturalists' Field Club.

VOL. I.

Belfast:
PRINTED FOR THE CLUB.

PREFACE.

IN the Annual Report of the Club for the year ending 31st March, 1870, it was stated that "The Committee considered it advisable that the Club should prepare complete lists of the Fauna, Flora, Geology, and Archæology of Ulster, by publishing an annual contribution to such a work in addition to the ordinary Report." The purpose thus indicated has been kept steadily in view, the work being inaugurated by Professor Ralph Tate, F.G.S., in a paper issued in 1870, as an appendix to the Report of that year. Owing to the long-continued researches, and the special knowledge required on the part of the authors of the lists, it has not been found possible to publish an appendix every year, nevertheless the series at the present time numbers twenty-one separate papers, extending over 342 pages, illustrated by 27 plates. Thus, though there have been occasional breaks in the regularity of the issue, it has so happened that sometimes several contributions were received and printed in one year, and accordingly the promise has been more than fulfilled.

The papers that form the present volume have all appeared as appendices to the Club's Proceedings, which are printed and distributed annually, but, with a view to their publication in a collected form, the appendices have been separately paged. In these Memoirs, there are given the results of long-continued and laborious research by members of the Club, in the subjects as to

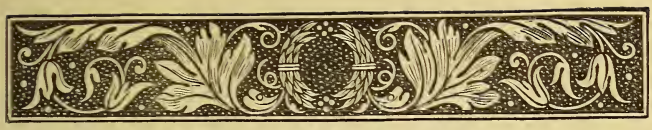
which they are most competent. These results are already in the possession of the earlier members; but it is considered that the time has now arrived when they should be given to those more recently elected, and to the general public.

In the treatment of the various subjects, conciseness has been the aim throughout; but the several compilers have arranged their matter in such manner as was considered by each the most suitable for the elucidation of his subject with brevity. Whatever opinions may be formed as to the style or method of these papers, it is certain that they furnish the fullest, most authentic, and most recent information respecting their different departments.

In issuing this, the first volume prepared in accordance with the plan of 1870, it is earnestly hoped that it may not only prove useful to such as are commencing to investigate, but that it may stimulate to further exertion those who have been long engaged in the work. Several branches of local Natural History remain still untouched, and much of our Archæology requires further elucidation; and for these purposes additional workers are wanted, and will doubtless be forthcoming. Many volumes such as this are required before the plan can be said to be complete, and it may reasonably be hoped that they will follow in due time. With a more ripened experience on the part of the Club, and a succession of compilers equally painstaking, but having still more extended knowledge, it may be anticipated that the present will be surpassed by future volumes of the series.

WILLIAM SWANSTON, F.G.S., } *Hon. Secs.*
F. W. LOCKWOOD, }

BELFAST, *November, 1886.*



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PRESENTED
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NATURAL HISTORY

APPENDIX I.

A LIST

OF THE

IRISH LIASSIC FOSSILS,

WITH NOTES ON THE NEW AND CRITICAL SPECIES,

BY RALPH TATE,

ASSOC. LIN. SOC., F.G.S., &c.

BRITISH MUSEUM NATURAL HISTORY

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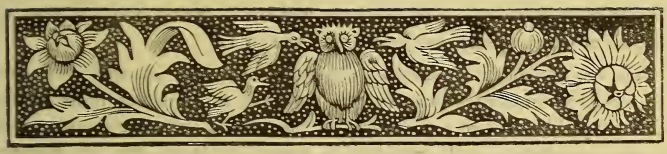

A LIST OF

THE IRISH LIASSIC FOSSILS,

WITH NOTES ON THE NEW AND CRITICAL SPECIES,

BY RALPH TATE, ASSOC. LIN. SOC., F.G.S., &c.

THE only Author, excepting myself, who has enumerated the fossils of the Lias of the Province of Ulster—that division of Ireland in which, only, that formation is developed—is the late General Portlock.

The specimens on which he based the list in the "Survey of Londonderry," pp. 747—769 (1843), now form part of the Collection of the Museum of Practical Geology, London, and that of the Museum of the Irish Geological Survey, Dublin; these I have carefully examined, and the results arrived at are embodied in List I, in the left hand column of which are arranged the specific names quoted by Portlock, and in the right hand those that I have adopted.

The sign ! is prefixed to those species, original specimens of which I have examined. Those included in brackets are for the present expunged from the list of Irish Liassic fossils, because from their known distribution, it is extremely probable that these determinations are erroneous; at any rate their identification requires further confirmation. Some species, examples of which are not now in the Portlockian Collection, have received new names. These are adopted, because there is no doubt that they are the species to which Portlock's descriptions are applicable, and which, moreover, have occurred to me in the Liassic strata of the North of Ireland.

The first column of List I. contains 107 specific names, but by the elimination of synonyms, and the rejection of a few doubtful determinations, the

number is reduced to 71. This has been increased during the last few years to 189, all of which species are catalogued in List II.

This list cannot be considered complete, inasmuch as additional species have been found time after time, on the occasion of revisiting those sections, which have yielded the greater number of the fossils, and which, consequently, from past experience, will continue to reward a search by an industrious collector.

The principal localities in County Antrim are Colin Glen and Cave Hill, near Belfast; Whitehead, Island Magee, and Waterloo, near Larne; Glenarm; between Garron Point and Red Bay; Ballintoy. In County Londonderry, Magilligan, Aghanloo, &c., whence Portlock obtained the majority of the species of his catalogue.

List No. II. shows the range of each species in the several members of the Lias, as described by me in the Quarterly Journal Geological Society, Vol. xx., p. 103 (1863); Vol. xxiii., p. 297 (1867); Vol. xxvi. (1870).

The Liassic system is represented in the North of Ireland by the formations termed Rhætic, Lower Lias, and Middle Lias.

The Rhætic series is as fully developed in the immediate neighbourhood of Belfast as in any portion of Great Britain; it is there capable of division into the "Avicula contorta-shales," and the White Lias. Not more than 29 species have been satisfactorily identified from this formation; 24 of these occur in the lower zone, and 13 in the upper, whilst 5 of them pass up into the Lower Lias.

The Lower Lias, which I have divided into four zones or palæontological horizons, has yielded 151 species, 2 of which are common to the Middle Lias. The "Planorbis Zone" has afforded 24 species; two only, *Gervillia acuminata, and Mytilus subtilis*, are confined to it, whilst the majority do not extend upwards beyond the overlying zone. The "Angulatus-beds," relatively rich in Gasteropods and Corals, have yielded 120 species, 26 of which pass to the upper zones. The "Bucklandi-beds" have not been so thoroughly searched as the lower zones, and I can only enumerate 21 species from them, but 5 of these appear to be limited to this horizon.

The Ballintoy, or "Belemnites acutus shales," have yielded 44 species. They are comparatively rich in peculiar Cephalopods, and 19 species in all are confined to this zone.

The Middle Lias at Ballintoy contains sixteen species, two only of which occur in the inferior beds.

In the following table are indicated the number of species known and inferred that pass from lower to higher zones, and the total number of species in each member of the Lias, and the per centage number of restricted species in each member.

	Avicula Shales	White Lias	Planorbis Zone	Angulatus Zone	Bucklandi Limestone	Belemnite Shales	Ballintoy Marls.	Total species known and inferred.	Per centage of restricted Species.
AVICULA SHALES ..	24	18	4	3	..	..	..	29	83
WHITE LIAS ..	..	13	5	4	..	..	..		
PLANORBIS ZONE ..	..	..	24	22	8	7	1	122	75
ANGULATUS ,, ..	..	..	..	120	26	17	1		
BUCKLANDI ,, ..	..	..	..	..	33	22	1	33	18
BELEMNITE SHALES	..	..	..	..	..	44	2	44	45
BALLINTOY MARLS	..	..	..	..	..	..	16	16	87·5

The specific names in List No. 2 supersede those which have previously been employed by me. The alterations have been necssitated in some cases on account of erroneous determinations, but, in the majority, because of the preference given to older names and synonymous denominations.

CATALOGUE I.

Amended List of Species cited by Portlock, from the Irish Lias.

CLASS PICES.

Species of Gen. Portlock's List.	Species adopted.
! Acrodus minimus, *Ag.*	Acrodus minimus, *Ag.*
! sp. *Portlock* t. xiv., fol. 17	Acrodus Tatei, *Moore, MS.*
! Gyrolepis Alberti, *Ag.*	Gyrolepis Alberti, *Ag.*
! Gyrolepis tenuistriatus, *Ag.*	Gyrolepis tenuistriatus, *Ag.*
! Saurichthys apicalis, *Ag.*	Saurichthys apicalis, *Ag.*

CLASS CEPHALOPODA.

! Ammonites armatus, *Sow.*	Ammonites armatus, *Sow.*
! Ammonites hastatus, *Y. & B.*	
! Ammonites Bucklandi, *Sow.*	Ammonites Bucklandi, *Sow.*
! Ammonites multicostatus, *Sow.* (pars)	Ammonites Sauzeanus, *D'Orb.*
! Ammonites Conybeari, *Sow.*	Ammonites Conybeari, *Sow.*
! Ammonites striatulus, *Sow.*	
! Ammonites elegans ? *Sow.*	Ammonites Buvgnieri, *D'Orb.*
! Ammonites læviusculus ? *Sow.*	
! Ammonites subradiatus ? *Sow.*	
! Ammonites intermedius, *Portl.*	Ammonites Johnstoni, *Sow.*
! Ammonites Johnstoni, *Sow.*	
Ammonites Lamberti, *Sow.*	Ammonites angulatus, *Schloth.*
! Ammonites MacDonnelli, *Portl.*	Ammonites MacDonnelli, *Portl.*
! Ammonites planorbis, *Sow.*	Ammonites planorbis, *Sow.*
! Ammonites Sampsoni, *Portl.*	
[Ammonites radians, *Rein.*]	?
! Ammonites multicostatus, *Sow.* (pars)	Ammonites raricostatus, *Ziet.*
! Ammonites rotiformis, *Sow.*	
! Belemnites abbreviatus, *Mill.*	Belemnites acutus, *Mill.*

CLASS GASTEROPODA.

! Cerithium carbonarium ? *Goldf.*	Cerithium gratum, *Terq.*
! Dentalium tenue, *Portl.*	Dentalium Portlocki, *Tate.*
! Melania *cf* Bronni, *Röm.*	Turritella Dunkeri, *Terq.*
! Trochus anglicus, *Sow.*	Pleurotomaria similis, *Sow.*
[Trochus fasciatus ? *Sow.*]	? Pleurotomaria similis, *Sow.*
Turritella percincta, *Portl.*	Cerithium percinctum, *Portl.*
! Turritella tenuicostata, *Portl.*	Cerithium tenuicostatum, *Portl.*

CLASS CONCHIFERA.

! Arca pulchra ? *Sow.*	Cucullæa Hettangiensis, *Terq.*
! Astarte elegans, *Phil.* ! Astarte tetragona, *Portl.*	Astarte Gueuxii, *D'Orb.*
! Avicula contorta, *Portl.*	Avicula contorta, *Portl.*
! Avicula inæquivalvis, *Sow.*	Avicula novemcostæ, *Brown.*
! Avicula modiolaris, *Goldf.*	Avicula Pattersoni, *Tate.*
Avicula substriata, *Brown.*	! Avicula papyria, *Quenst.*
! Cardium striatulum, *Sow.*	Cardium Philippianum, *Dunk.*
! Cardium truncatum, *Sow.*	Cardium Rhæticum, *Merian.*
Corbis ? ovalis, *Phil.*	Lucina limbata ? *Terq. & P.*
! Cucullæa cucullata, *Goldf.*	Cucullæa Grangeri, *Tate.*
! Gryphæa cymbium, *Lamk.*	Ostrea cymbium, var. obliqua, *Lamk.*
! Gryphæa bullata ? *Sow.* Gryphæa dilatata, *Sow.* ! Gryphæa MacCullochi, *Sow* (pars)	Ostrea MacCullochi, *Sow.*
! Gryphæa incurva, *Sow.*	Ostrea arcuata, *Lamk.*
[Gryphæa MacCullochi, *Sow.* pars.]	[Gryphæa vesiculosa, *Sow.* Cretaceous.]
! Inoceramus cinctus ? *Goldf.*	Perna infraliassica, *Quenst.*
! Lysianassa rhombifera, *Goldf.*	Goniomya Sinemuriensis, *Oppel.*
! Lima alternans, *Röm.* Lima cardüformis, *Sow.* ! Lima pectinoides, *Sow.*	Lima pectinoides, *Sow.*
! Lima antiquata, *Sow.* ! Lima Hermanni, *Goldf.*	Lima succincta, *Schloth.*
! Lima rustica ? *Sow.*	Lima succincta, *var., jun.*
! Lima duplicata, *Sow.*	Lima Hettangiensis, *Terq.*
! Lima gigantea, *Sow.*	Lima gigantea, *Sow.*
! Lima proboscidea ? *Sow.*	Lima Terquemi, *Tate.*
! Lima punctata, *Sow.*	Lima punctata, *Sow.*
! Modiola bipartita ? *Sow.*	Mytilus rusticus, *Terq.*
Modiola compressa, *Goldf.*	?
! Modiola Hillana, *Sow.*	Mytilus Hillanus, *Sow.*
! id. pars. ! Modiola minima, *Sow.*	Mytilus minimus, *Sow.*
! Modiola alæformis, *Sow.*	Hippodium ponderosum, *Sow.*
! Modiola oblonga ? *Röm.*	Cypricardia compressa, *Terq.*
! Modiola, nov. spec.	Myoconcha psilonoti, *Quenst.*
! Modiola scalprum, *Sow.*	Mytilus Gueuxii, *D'Orb.*
! Nucula antiquata ? *Sow.* ! Nucula subglobosa ? *Röm.* ! Nucula variabilis ? *Sow*	Nucula navis, *Piette.*
! Nucula rostralis, *Goldf.*	Leda tenuistriata, *Piette.*
! Ostrea acuminata, *Sow.*	Ostrea irregularis, *Münst.*

! Ostrea, nov. spec.	Terquemia, arietes, *Quenst.*
! Pachyodon concinnus, *Sow.*	Cardinia concinna, *Sow.*
! Pachyodon crassiusculus, *Sow.* ! Pachyodon ovalis, *Stutch.*	Cardinia ovalis, *Stutch.*
! Pachyodon hybridus, *Sow.*	Cardinia Listeri, *Sow*, var. hybrida.
Pachyodon imbricatus, *Stutch.*	Cardinia Listeri, *Sow.*, var. imbricata.
! Panopæa ? elongata, *Röm.*	Anatina longissima, *Quenst.*
! Pecten sublævis ? *Phil.* ! Pecten subulatus ? *Münst.* ! Pecten textilis ? *Münst.*	Pecten dextilis, *Münst.*
! Pecton textorius ? *Schloth.* ! Pecten virguliferus ? *Phil.*	Pecten textorius, *Schloth.*
! Pecten Valoniensis, *Defr.*	Pecten Valoniensis, *Defr.*
! Pecten vitreus, *Röm.* ! Pecten calvus, *Goldf.* ! Pecten cingulatus, *Goldf.*	Pecten lunularis, *Röm.*
! Pinna cuneata, *Phil.* ! Pinna lanceolata, *Sow.* Pinna mitis ? *Phil.*	Pinna folium, *Y. & B.*
! Pinna Hertmanni, *Ziet.*	Pinna Harmanni, *Ziet.*
! Plicatula spinosa ? *Sow.*	Plicatula spinosa, *Sow.*
! Pholodomya longirostris, *Schloth.*	Pholodomya Fraasii, *Oppel.*
! Pholadomya ventricosa, *Goldf.*	Pholadomya glabra, *Ag.*
! Pholadomya myacites.	Pleuromya liasina, *Schübl*
! Pullastra ?	Pleuromya galathea, *Ag.*
Unio Listeri, *Sow.* ! Unio Nilssoni, *K. & D.*	Cardinia Listeri, *Sow.*
Unio peregrinus ? *Phil.* ! Unio trigonus, *Röm.*	Cardinia ovalis, *Stutch.*
! Unio subæqualis.	Unicardium cardioides, *Phil.*

CLASS BRACHIOPODA.

! Lingula Beanii, *Sow.*	Lingula Metensis, *Terq.*
Terebratula Mantelliana ? *Sow.*	Rhynchonella plicatissima, *Qnst.*
Terebratula obovata, *Sow.* ! Terebrata ornithocephala, *Sow.*	Waldhemia perforata, *Piette.*

CLASS ANNELIDA.

! [Serpula lævis, *Goldf.*	Serpula filiformis, *Sow.* Cretaceous].

CLASS ECHINODERMATA.

! Pentacrinites basaltiformis	? Extracrinus Briareus, *Mill.*

CATALOGUE II.

An Enumeration of the Liassic Species in the Irish Sub-divisions.

Explanations of Abbreviations.

v.c. very common; *c.* common; *x.* not common, or frequency unobserved; *r.* rare; *v.r.* very rare.

List of Species.	Distribution.							
	Rhætic.		Lower Lias.				Midle. Lias.	
	Avicula Shales.	White Lias.	A. planorbis Zone.	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales.	Ballintoy Marls.	
Class Reptilia.								
Ichthyosaurus sp. (femur, teeth),....	r.	...	...	...	...	...	...	...
Ichthyosaurus (vertebræ),.....	...	...	...	x.	...	...	...	...
Class Pices.								
Acrodus minimus, *Ag*.....	c.	...	...	...	...	...	...	...
Acrodus Tatei, *Moore*.....	c.	...	...	...	...	...	...	...
Gyrolepis Alberti, *Ag*.....	c.	...	...	...	...	...	...	...
Gyrolepis tenuistriatus, *Ag*.....	x.	...	...	...	...	...	...	...
Hybodus minor, *Ag*.....	x.	...	...	...	...	...	...	...
Hybodus raricostatus, *Ag*.....	r.	...	...	...	...	...	...	...
Hybodus reticulatus, *Ag*.....	...	..	...	...	...	...	r.	...
Saurichthys apicalis, *Ag*.....	c.	...	...	...	...	...	...	...
Class Cephalopoda.								
Ammonites angulatus, *Schloth*.....	...	...	r*	r.	...	...	...	*Portrush.
Ammonites armatus, *Sow*.....	...	...	...	...	...	c.	...	...
Ammonites Birchii, *Sow*...	...	...	...	...	...	r.	...	...
Ammonites Bucklandi, *Sow*.....	...	...	...	...	x.	x.	...	...
Ammonites Buvgneiri, *D'Orb*.....	...	...	...	...	...	x.	...	...
Ammonites Conybeari, *Sow*.....	...	...	...	...	...	c.	...	...
Ammonites Cluniacensis, *Dumort*..	...	...	...	...	...	x.	...	...
Ammonites Johnstoni, *Sow*.....	...	...	c.	v.c.	...	...	...	...
Ammonites MacDonnelli, *Portl*....	...	...	...	x.	...	...	...	...
Ammonites margaritatus, *Montf.*	...	...	...	...	...	...	r.	...
,, var. coronatus, *Quenst*								
Ammonites Henleyi, *Sow*.....	...	...	...	...	...	...	x.	On authority Mr. Etheridge.
Ammonites planorbis, *Sow*.....	...	...	c.	x.	...	...	...	...
Ammonites Sauzeanus, *D'Orb*.....	...	...	...	x.	...	...	...	Gortmore, Col. Geo. Survey of Ireland.
Ammonites Turneri, *Sow*.....	...	...	...	x.	v.c.	...	...	...
Ammonites raricostatus, *Sow*.....	...	...	...	...	...	c.	...	...
Belemnites acutus, *Mill*.....	...	...	...	...	...	c.	...	...
Belemnites pencillatus, *Mill*.....	...	...	...	...	...	x.	...	On authority Prof. Phillips.
Belemnites præmaturus, *Tate*.....	...	...	...	r.	...	...	...	...
Belemnites umbilicatus, *Blainv*.....	...	...	...	...	...	...	c.	...
Nautilus striatus, *Sow*.....	...	...	...	x.	...	...	...	...
Class Gasteropoda.								
Actæonina avena, *Terq*.....	...	...	...	x.	...	...	...	...
Actæonina fragilis, *Dunk*.....	...	...	...	c.	...	...	...	...

TABLE—(CONTINUED.)

List of Species.	Distribution.							
	Rhætic.		Lower Lias.				Midle. Lias.	
	Avicula Shales.	White Lias.	A. planorbis Zone.	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales.	Ballintoy Marls.	
Actæonina striata, *Piette*	...	...	...	x.	...	...	...	...
Cerithium gratum, *Terq.*	...	...	...	v.c.	...	...	...	...
Cerithium Semele, *D'Orb*	...	...	...	c.	x.	...	...	...
Cerithium percinctum, *Portl.*	...	...	...	x.	...	...	...	On authority of Gen. Portlock.
Cerithium tenuicostatum, *Portl.*	...	...	...	c.	...	...	...	...
Chemnitzia punctata, nov. spec.	...	...	...	v.r.	...	...	...	...
Chemnitzia Berthaudi, *Dumortier*	...	...	...	v.c.	...	...	...	=Chemnitzia Tylori, *Tate.*
Cryptænia Brycei, *Tate*	...	...	...	r.	r.	...	...	...
Cryptænia expansa?, *Sow*	...	...	...	r.	...	...	...	...
Cryptænia rotellæformis, *Dunk*	...	...	...	v.r.	...	...	...	...
Dentalium Portlocki, nov. spec.	...	...	...	x.	...	...	...	...
Littorina Chapuisi, *Terq & Piette*	...	...	...	v.r.	...	...	...	...
Littorina elegans, *Münst*	...	...	...	v.c.	...	...	...	...
Littorina liassica, *Martin*	...	...	...	r.	...	...	...	...
Littorina Strophium, *Dumort sp.*	...	...	...	...	...	v.r.	...	...
Natica Oppelii, *Moore*	x.	...	...	...	...	...	...	...
Pleurotomaria similis, *Sow*	...	...	...	r.	r.	...	...	...
Pleurotomaria Tectaria, nov. spec.	...	...	...	r.	...	...	...	...
Phasianella Morencyana, *Trq. & Pte.*	...	...	...	c.	...	...	...	...
Pitonillus turbinatus, *Moore*	...	...	...	...	...	...	c.	...
Solarium Thomsoni, nov. spec.	...	...	...	r.	...	...	...	...
Tornatella inermis, *Terq.*	...	...	...	x.	...	...	...	Waterloo.
Tornatella Robinsoni, nov. spec.	...	...	...	...	...	v.r.	...	...
Trochus Waltoni, *Moore*	x.	...	...	...	...	...	...	...
Turitella crassilabrata, *Trq. & Pte.*	...	...	...	v.r.	...	...	...	...
Turitella Dunkeri, *Terq.*	...	...	...	r.	...	...	...	...
Turbo solarium, *Piette*	...	...	...	x.	...	...	...	=Turbo Burtoni, *Tate*, Garron Point.
Class CONCHIFERA.								
Anatina longissima, *Quenst*	...	...	x.	?	?	x.	...	...
Anatina myacina, nov. spec.	...	...	...	v.r.	...	...	...	...
Anatina præcursor, *Quenst*	...	x.	...	...	...	...	...	...
Anomia irregularis, *Terq*	x.	x.	...	...	...	...	...	...
Anomia pellucida, *Terq*	...	...	...	x.	?	x.	...	...
Anomia striatula, *Op.*	...	...	...	x.	...	...	...	...
Arca pulla, *Terq*	...	...	...	x.	...	...	...	...
Astarte Gueuxii, *D'Orb*	...	...	...	x.	?	x.?	...	=Astarte dentilabrum, *Etheridge.*
Astarte cingulata, *Terq*	...	...	...	x.	...	...	...	...
Astarte Oppelii, *Andler*	...	...	...	x.	...	...	...	=A Saulensis, *T. & P.*, Coll. Geo. Survey, Ireland.
Axinopsis Ewaldi, *Bornem.*	x.	x.	...	...	...	...	...	=Axinus cloacinus, *Quenst.*
Axinopsis concentricus, *Moore*	...	x.	...	...	...	...	...	...
Avicula acuticosta, *Terq & Piette*	...	...	...	...	x.	...	...	...

TABLE—(CONTINUED.)

List of Species.	Distribution.							
	Rhætic.		Lower Lias.				Midle. Lias.	
	Avicula Shales.	White Lias.	A. planorbis Zone.	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales	Ballintoy Marls.	
Avicula contorta, *Portl.*	x.	...	...	...	...	...	...	...
Avicula Dunkeri, *Terq.*	...	...	x.	x.	...	...	...	...
Avicula fallax,	...	x.	...	...	...	...	...	=Monotis decussata.
Avicula novemcostæ, *Brown*	...	...	x*	?	x.	x.	c.	*Portrush (*Portlock.*)
Avicula Pattersoni, nov. spec.	...	...	...	x.	...	...	...	...
Avicula papyria, *Quenst.*	...	...	...	...	...	x.	...	...
Cardium Philippianum, *Dunk.*	...	...	...	x.	...	...	...	...
Cardium Rhæticum, *Merian*	x.	x.	...	...	...	...	...	...
Cardinia amygdala, *Terq*	...	...	...	x.	...	...	...	...
Cardinia Deshayesi, *Terq*	...	...	...	x.	...	...	...	...
Cardinia cyprina, *Ag.*	...	...	...	x.	...	...	...	...
Cardinia concinna, *Sow*	...	...	...	x.	...	...	...	...
Cardinia Listeri, *Sow*	...	...	...	r.	r.	...	...	...
Cardinia Listeri, var. hybrida	...	...	...	...	x.	v.r.	...	...
Cardinia ovalis, *Stutch*	...	...	x.	v.c.	...	...	...	...
Cardita Heberti, *Terq.*	...	...	...	c.	...	...	...	...
Cardita multicostata, *Phil.*	...	...	...	...	...	...	r.	...
Ceromya gibbosa, *Etheridge*	...	...	...	x.	...	...	...	=Isocardia Elea, *d'Orb.*
Cypricardia compressa, *Terq.*	...	...	...	x.	...	...	...	...
Cypricardia lævigata, *Terq.*	...	...	...	...	...	x.	...	...
Cypricardia tetragona, *Terq.*	...	...	...	x.	...	...	...	...
Cypricardia cucullata, *Goldf.*	...	...	...	...	...	...	r.	...
Cucullæa Grangeri, nov. spec.	...	...	...	...	...	c.	...	...
Cucullæa Hettangiensis. *Terq*	...	x*	?	c.	...	...	...	*Cave Hill, =Arca Lycetti, *Moore*
Cucullæa oxynoti, *Quenst.*	..	..	..	..	v.r.	..	..	..
Gervillia acuminata, *Terq.*	...	...	x.	...	...	...	...	=Avicula lanceolata, *Sow.*
Goniomya Sinemuriensis, *Op.*	...	...	...	v.r.	?	x.	...	...
Hippopodium ponderosum, *Sow*	...	...	...	...	...	x.	...	Col. Geol. Survey of Ireland.
Hinnites angularis, nov. spec.	...	...	...	r.	...	...	...	...
Leda Bronni, *Andler*	...	...	...	x.	x.	x.	...	...
Leda Dewalquei, *Terq & Piette*	...	...	...	...	x.	...	...	...
Leda Quenstedti, nov. spec.	...	...	x.	x.	x.	x.	...	...
Leda Renevieri, *Oppel.*	...	...	x.	x.	x.	...	...	...
Leda v-scripta, nov. spec.	...	...	...	v.r.	...	...	...	...
Leda tenuistriata, *Piette*	...	...	...	x.	?	x.	...	...
Lima gigantea, *Sow.*	...	...	...	v.c.	...	...	...	...
Lima Hettangiensis, *Terq.*	...	...	...	x.	x.	...	...	Island Magee.
Lima pectinoides, *Sow*	...	...	x*	v.c.	x.	x.	...	*Portrush.
Lima præcursor, *Quenst.*	x.	...	...	...	...	..	...	...
Lima punctata, *Sow*	...	...	...	c.	...	...	...	...
Lima succincta, *Ziet*	...	...	x*	x.	...	...	...	*Portrush.
Lima Terquemi, *Tate*	...	...	...	c.	...	...	...	=Lima exaltata, *Terq.*
Lima Valoniensis, *Def.*	x.	...	...	...	...	...	...	Col. Geol. Survey of Ireland.

TABLE—(CONTINUED.)

List of Species.	Distribution.							
	Rhætic.		Lower Lias.				Midle. Lias.	
	Avicula Shales.	White Lias.	A. planorbis Zone	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales.	Ballintoy Marls.	
Limea acuticosta, *Goldf.*	...	...	...	...	...	...	c.	...
Myoconcha oxynoti, *Quenst.*	...	...	...	...	...	x.	...	...
Myoconcha psilonoti, *Quenst.*	...	...	...	x.	...	...	...	Garron Point.
Mytilus glabratus, *Dunk.*	...	...	...	x.	...	...	...	...
Mytilus Hillanus, *Sow*	...	...	...	x.	...	...	...	...
Mytilus lævis, *Sow*	...	...	...	c.	...	...	...	...
Mytilus minimus, *Sow*	x.	x.	x.	...	...	...	...	...
Mytilus minutus, *Goldf.*	x.	x.	...	...	...	...	...	...
Mytilus Gueuxii, *D'Orb*	...	...	...	x.	?	x.	...	..
Mytilus lamellosus, *Terq.*	...	...	...	x.	...	...	..	Island Magee.
Mytilus rusticus ? *Terq.*	..	..	...	x.	..	..	..	..
Mytilus subtilis, nov. spec.	...	...	v.r.	..	..	..	...	..
Lucina limbata ? *Terq. & P.*	...	...	..	x.	x.	x.	...	...
Myophora Emmerichi,	x.	..	...	...	...	...	...	...
Nucula navis, *Piette*	...	...	...	x.	...	...	..	...
Ostrea arcuata, *Lamk.*	...	...	...	r.	v.c.	...	...	..
Ostrea MacCullochi, *Sow*	...	...	...	...	x.	x.	...	...
Ostrea cymbium, var. obliqua, *Sow.*	...	...	...	...	...	x.	...	...
Ostrea irregularis, *Münst.*	x.	x.	x.	x.	...	...	...	...
Pecten acutiradiatus, *Ziet.*	...	...	...	...	...	..	v.c.	...
Pecten lunularis, *Röm.*	...	...	x.	x.	...	...	...	=Pecten Hehlli, *D'Orb.*
Pecten liasinus, *Nyst.*	...	...	...	...	...	...	r.	...
Pecten punctatissimus, *Quenst.*	...	...	...	x.	...	...	...	Glenarm, &c.
Pecten textorius, *Goldf.*	...	...	...	x.	...	...	...	...
Pecten texturatus, *Goldf.*	...	...	...	..	..	c.	...	..
Pecten Valoniensis, *Defr.*	x.	..	..	...	...	...	...	...
Pecten dextilis, *Röm.*	...	...	x*	x.	...	...	..	*Portrush.
Perna infraliasina, *Quenst.*	...	...	x.	x.	...	...	...	...
Pinna folium, *Y. & B.*	...	...	...	x.	...	...	...	?=Pinna semicostata, *T. & P.*
Pinna Hartmanni, *Münst.*	...	...	...	x.	...	? r.	...	...
Plicatula Deslongchampsi, *Terq.*	...	...	...	v.r.	...	...	...	Waterloo.
Plicatula Hettangiensis, *Terq.*	...	...	...	x.	...	...	...	...
Plicatula intusstriata, *Emmer.*	x.	?	?	x.	...	...	...	...
Plicatula spinosa, *Sow.*	...	...	...	...	...	x.	v.c.	...
Plicatula sarcinula, *Münst.*	...	...	...	..	...	x.	...	...
Pleuromya galatea, *Ag.*	..	..	...	x.	...	...	...	...
Pleuromya liasina, *Schubl.*	...	...	..	...	...	x.	...	...
Pleuromya striatula, *Ag.*	...	...	...	x.	?	x.	...	...
Pleuromya crassa, *Ag.*	...	x.	...	...	...	...	...	...
Pholadomya glabra, *Ag.*	...	...	x.	x.	?	x.	...	...
Pholadomya Fraasii, *Oppel*	...	...	...	x.	...	...	...	...
Pholadomya ventricosa, *Ag.*	...	...	...	r.	...	...	...	Waterloo.
Terquemia arietes, *Quenst.*	...	...	...	x.	?	x.	...	...
Thracia æquata, nov. spec.	...	...	...	v.r.	...	...	...	...
Unicardium cardioides, *Phil.*	...	...	x.	c.	?	c.	...	...
Class BRACHIOPODA.								
Discina Holdeni, *Tate.*	...	...	...	x.	...	...	...	...
Lingula Metensis, *Terq.*	...	...	...	x.	?	x.	..	...
Rhynchonella acuta, *Sow*	...	...	...	...	...	...	r.	...

TABLE—CONTINUED.)

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	Avicula Shales.	White Lias.	A. planorbis.	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales.	Ballintoy Marls.	
Rhynchonella plicatissima, *Quenst.*	...	...	..	...	r.	r.	...	...
Rhynchonella variabilis, *Schloth*	..	..	..	...	...	...	r.	..
Waldheimia numismalis, *Lamk*	..	..	...	..	..	..	r.	..
Waldheimia perforata, *Piette*	..	..	..	x.	?	x.	..	..
Class CRUSTACEA.								
Eryma ? sp	..	..	..	x.	..	..	..	..
Cythere liassica, *Brodie*	..	..	x.	x.	x.	c.	..	..
Pollicipes alatus, nov. spec.	..	..	..	x.	..	..	..	..
Class ANNELIDA.								
Serpula capitata, *Phil.*	..	..	..	x.	..	..	..	..
Serpula globiceps, *Quenst.*	..	..	..	x.	..	..	..	Waterloo.
Serpula olifex, *Quenst.*	..	..	..	x.	..	..	..	..
Serpula socialis, *Goldf.*	..	..	..	c.	..	..	..	..
Class ECHINODERMATA.								
Cidaris Edwardsii, *Wright.*	..	..	..	v.c.	..	..	..	..
Pentacrinus scalaris, *Goldf.*	..	..	..	..	v.c.	..	..	..
Pentacrinus sp.	..	..	..	..	..	..	c.	..
Extracrinus Briareus, *Mill*	..	..	..	x.	..	..	..	..
Ophioglypha Gaveyi ? *Wr.*	..	..	..	v.r.	..	..	..	Island Magee.
Ophioglypha sp.	x.	..	..	..	..	..	..	Larne, Geo. Survey.
Hemipedina Bechei, *Wr.*	?x.	?	x.	x.	..	..	..	..
Class ZOANTHARIA.								
Montlivaltia Haimei, *Chap. & Dew.*	..	..	..	x.	x.	x.	..	..
Montlivaltia Hibernica, *Duncan*	..	..	..	v.r.	..	..	..	Island Magee.
Montlivaltia papillata, *Duncan*	..	..	..	v.r.	..	..	..	Island Magee.
Montlivaltia polymorpha, *Tq. & Pte.*	..	..	..	x.	..	..	..	Garron Point.
Montlivaltia mucronata, *Duncan*	..	..	..	x.	..	..	..	Coll. Geo. Survey of Ireland.
Oppelismilia gemmans, *Duncan*	..	..	..	v.r.	..	..	..	Waterloo.
Septastræa Fromenteli, *T. & P.*	..	..	..	r.	..	..	..	Island Magee.
Class FORANIMIFERA.								
Dentalina obliqua,	..	..	..	..	..	x.	..	..
PLANTAE.								
Fucoides sp.	..	..	..	x.	..	..	..	..
Known,	24	11	22	118	21	44	16	
Inferred,	..	2	2	2	12	..	..	
	24	13	24	120	33	44	16	Total, 189.

PALÆONTOLOGICAL NOTES

AND

DESCRIPTION OF NEW SPECIES.

1. BELEMNITES PRÆMATURUS, *Tate*, Geological Magazine, Vol. vi., p. 166 (1869).

Description.—Guard slightly sub-hastate, terminating in an acute central point, contracted in all regions about the alveolar apex, and tapering very gradually to the point. On the lateral faces of the anterior part of the guard there are two distinct furrows, which extend to about the middle part. Axis apparently straight. Phragmacone in its transverse section sub-oblong, the dorso-ventral diameter being the longer. Extreme length ·35 inch; length of axis, so far as traceable, ·11 inch.

Geological Position.—Zone of "*Ammonites angulatus*," Lower Lias, Island Magee, Co. Antrim (2 Specimens; *R. T.*)

a. Outline, nat. size.
b. Enlarged.

Remarks.—The only other *Belemnites* in the Lower Lias of Ireland are *B. acutus*, and *B. pencillatus*, which occur in the marls at Ballintoy, at a much higher horizon than the shelly limestones whence *B. præmaturus* has been obtained. Naturally the question arises, may not this form be the young state of one or other of these species? The presence of lateral furrows in *B. præmaturus* precludes such a relationship. The affinity to *B. clavatus*, Bl., is more obvious, but it has not the elegant fusiform outline of the young of that species. Professor Phillips (Geol. Mag. Vol. vi., p. 239) remarks, that *B. præmaturus* must certainly be distinguished from every variety of *B. clavatus*, and may prove to be closely allied to *B. pencillatus*, which is by no means always deprived of lateral furrows.

B. præmaturus was published by me as the oldest-known British Belemnite, but Mr. C. Moore had obtained a very small conical specimen from beds immediately above those which yield *Ostrea liassica*; and the Rev. P. B. Brodie "a mere fragment from the insect beds ('*A. planorbis*' zone) at Bruton." Neither of these older specimens have received specific names.

2. AMMONITES MACDONNELLI, *Portlock*, Geol. Surv. Derry, p. 134 (1843).

Appears a good species; it has the general form of *A. planorbis*, with a thin prominent keel, and distant, faint, sigmoidal ribs on the outer whorl, in

the centre whorls the ribs are distinct, numerous, close, sharp and having only a slight sigmoidal bend. The species is peculiar to the Irish Lias.

3. CERITHIUM TENUICOSTATUM, *Portlock sp.*, Plate I. fig. 8.

Turritella (Cerithium) tenuicostata, Portlock, Geol. of Derry, p. 124 (1843).

This species was described by Portlock, in the following words :—"Whorls convex ; spiral threads of two sizes; three strong on the lower half of the whorl, and one fine below them. On the upper half there are four or five fine threads, which are very close together ; whilst the strong threads of the lower half are separated by a considerable space. The fine threads are in like manner separated from the strong, by a space equal to the separating space of these lines. All these spiral threads are crenulated by numerous very fine-curved longitudinal threads, of which there must be more than 30 on a whorl. Very minute, 6 whorls in ·25 of an inch."

C. tenuicostatum is a very variable species ; when the medial longitudinal ribs are prominent, the whorls are bicarinated, as shown in fig 8, (*) which represents an extreme form; whilst on the other hand, as the threads assume less prominence, the whorls become proportionately more regularly convex. It agrees in all its characters, except that of size, with *C. Semele*, D'Orb., with which it is associated, and should further examination prove that *C. tenuicostatum* is only a depauperated condition of *C. Semele*, then Portlock's name has priority of publication.

4. CERITHIUM PERCINCTUM, *Portlock (Turritella)*, loc. cit., p. 123.

"Very minute, eight whorls in ·25 of an inch. Of the raised spiral lines, one along the centre of the whorl is more elevated than the others, and another below is nearly as much so—a finer line being between; which produces the appearance of a band. Above the stronger line there are three or four finer, though still well-marked lines; and below it also three or four, including the second stronger line."

I have not met with any shell that agrees with the above description, and the type appears to have been lost. But that no mention is made of transverse striæ, and indeed it must be conceded that none are present, because compared by Portlock, with *T. minuta*, K. & D., and *T. cingenda*, Sow., in which no transverse striæ occur, I should be disposed to regard this species as the bicarinated form of *C. tenuicostatum*.

5. CHEMNITZIA PUNCTATA, *nov. spec.*, Plate I. fig. 11.

Shell conical, whorls about six, sub-inflated, with numerous narrow depressed longitudinal costatulæ, with about equally broad slightly impressed sulci, which are regularly pitted ; the punctuations are ranked transversely by

* The transverse ribs are much finer and more numerous than shown in the figure ; and the whorls should have been more markedly bicarinated. (R. T.)

faint concentric striæ. The aperture is not exposed ; but I have no hesitation in referring the shell to the genus *Chemnitzia.*

Geological Position—Zone of "*A. angulatus,*" Island Magee, Co. Antrim (*S. A. Stewart*).

6. CHEMNITZIA BERTHAUDI, *Dumortier*, Etudes Pal. sur les Dépots Jurassiques du Bassin du Rhone, p. 174, tab. xiv, fig. 2, 1867.

Chemnitzia Tylori, Tate, Quart. Jour. Geol. Soc., Vol. xx, p. 313 (1867).

Shell turreted, elongated, consisting of ten whorls separated by a deep suture, concave, and ornamented by about twenty very prominent curved smooth ribs; the sulci faintly striated; base slightly carinated, smooth or faintly radiated. Total length ·3 inch, breadth of last whorl ·07 inch.

Affinities and Differences.—By its ornamentation closely allied to *C. costifera*, Piette, and *Cerithium Henrici*, Martin, but differs from the former apparently in the proportion of its dimensions, and in the less arched outline of the costæ ; and from the latter in being only about half the length of that shell, which is provided with only eight whorls. I have no hesitation in referring the shell I had described as *C. Tylori* to *C. Berthaudi*, Dumortier, which has priority by some months.

Geological Position.—*C. Berthaudi* is a common shell in the zone of "*A. angulatus,*" Island Magee, Co. Antrim. The type of the species is unique, and was obtained from the zone of "*A. Bucklandi*" at Peronne, Rhone.

7. SOLARIUM THOMSONI, *nov. spec.*, Plate I. fig. 9.

Shell orbicular, a little wider than high, spire slightly raised, composed of four whorls, smooth, or ornamented with about 6 raised lines ; last whorl rounded, smooth ; aperture quadrate ; base flat, with fine striæ of growth ; umbilicus narrow and slightly crenulated on its border. Height, ·075 inch ; diameter, ·085 inch.

Remarks.—*S. Thomsoni* is allied to *S. lenticulare*, Terq., but differs in its more embracing whorls and Rotella-like appearance, in its smaller umbilicus, and its more conical form.

Geological Position—Zone of "*A. angulatus,*" Glenarm ; (rare, *R. T*).

The species is dedicated to Professor Wyville Thomson, F.R.S., President of the Natural History Society, Belfast.

8. CRYPTÆNIA BRYCEI. *Tate*, Quart. Jour. Geol. Soc., Vol. xxiii., p. 413 (1867). Plate I. fig. 13.

Shell subdiscoid, depressed ; test thin, whorls four, nearly flat or slightly concave ; bluntly carinated ; upper surface of the whorls transversely striated ; base convex, smooth ; callosity large, circumscribed by a sulcus, slightly excavated near the columella lip ; siphonal band narrow, rather above than below the keel ; aperture, sub-triangular.

Remarks.—*C. Brycei* is somewhat intermediate between *C. caepa*, Desl., and *C. expansa*, Sow. ; it is related to the latter by the concave and carinated whorls, by the band being above the keel, and by the large callus, but differs in its more regularly conoidal form, without the ventricosity of the under surface, and by the absence of the raised border to the posterior suture.

Geological Position.—Zone of "*A. angulatus*," Island Magee ; (rare, *Gray & Tate*) ; Garron Point, Co. Antrim (*R. T*).

9. TORNATELLA ROBINSONI, *nov. spec.*, Plate I. fig. 7.

Shell ovate-oblong ; spire produced, apex acute ; whorls scalariform, a little obtuse, and with an elevated margin ; the whole surface ornamented with fine longitudinal striæ, whilst from the posterior suture fine curved lines proceed to a little beyond the shoulder of the whorl ; aperture ovate, acute ; columella with a single plait.

Geological Position.—Zone of "*Belemnites acutus*," Ballintoy ; very rare (Coll. Belfast Museum).

Dedicated to Mr. Hugh Robinson, one of the energetic Secretaries of the Belfast Naturalists' Field Club.

10. DENTALIUM PORTLOCKI, *nov. spec.*, Plate I. fig. 15.

1843 *Dentalium tenue*, Portlock. loc. cit., p. 118 (non Goldfuss, 1841).

1856 *Dentalium Andleri*, Oppel, Die Juraformation, p. 93 (probably).

1863 *Dentalium minimum*, pars, Tate, Quart. Jour. Geol. Soc., Vol. xx., p. 3.

1867 *Dentalium tenue*, Tate, id., Vol. xx., p. 311.

Remarks.—In 1863, I referred *D. tenue*, of Portlock, to *D. minimum*, Strickland, as I then considered the two names synonymous, adopting the latter, because the specific name applied by Portlock was pre-occupied by a *Dentalium* described by Münster, to which species his shell is not referable ; at a later period I regarded them as distinct, and erroneously gave priority to Portlock's employment of the specific name. In giving the above denomination to the species described by Portlock, I wish to commemorate the labours of that geologist. The original diagnosis is as follows :—"The longest ·4 of an inch, is about ·04 of an inch in diameter at the largest end, and tapers to a fine point ; it is very slightly curved." *D. Andleri*, Oppel, is probably a synonym to *D. Portlocki* ; the only character given is, that it is small—"die kleine species ;" but, assuming that the two names refer to the same species, the imperfect diagnosis of Oppel justifies me in discarding his name.

11. PLEUROTOMARIA TECTARIA, *nov. spec.*

Shell turbinated conical, scalariform, spire acute ; whorls six, subquadrate, last whorl with two prominent carinæ, separated by a slightly concave area ; surface of whorls strongly longitudinally striated, upper part of each whorl

cancellated by very fine oblique striæ. Siphonal band very narrow, occupying a slight depression on the upper carina, ornamented with three longitudinal striæ. Base imperforate, concentrically striated ; aperture subquadrangular.

Dimensions.—Total length, ·9 inch ; breadth of last whorl, ·6 inch ; height of last whorl, ·4 inch.

P. Tectaria cannot be confounded with any Liassic species of the genus, though related to *P. subtilis*, Deslong. It resembles in figure, several Palæozoic forms, and especially *P. tornatilis*, Phil., from the Carboniferous Limestone.

Geological Position.—Zone of *A. angulatus*, between Garron Point and Red Bay, two examples *(R. T.)* ; Island Magee, one example *(S. A. Stewart)*.

12.—HINNITES ANGULARIS, *nov. spec.*, Plate I. fig. 2.

Shell inequivale, subinæquilateral, thick, left valve convex, transversely oblong; umbo subacute, not extending beyond the hinge line, which is moderately arched; ornamented with crowded radiating ribs, unequal, obtuse, the surface of which is raised into spinous squamæ, and alternating irregularly with smaller and similarly ornamented costæ; costæ of umbonal region without spinous nodulations. Five or six of the radiating costæ are much stronger than the others, and somewhat regularly disposed, giving a polygonal outline to the valve. Ears ornamented as the rest of the shell. Right valve ornamented as the other valve. Breadth 2·5 inches, length 2 inches.

H. angularis agrees with *Lima nodulosa*, Terq., in the radiating spiniferous ribs, alternately large and small; but differs in the absence of rugous, serrated concentric striæ, and in its greater gibbosity, oblong figure, inequivalve character, and by the polygonal outline given to it by the larger ribs.

Geological Position.—Zone of "*A. angulatus*," Island Magee, two examples (*R. T.*); lowest beds of Lower Lias, Laleston, S. Wales. (*R. Etheridge*), Coll. Brit. Museum.

13.—AVICULA PATTERSONI, *nov. spec.*, Plate I. fig. 10.

Shell depressed, ovate, transverse, slightly oblique, concentrically striated; anterior margin arched, and superiorly sinuated; hinge line straight; anterior wing very short, acute; posterior wing elongated, acuminated, excavated behind.

A. Pattersoni has a general resemblance to *Gervillia crenatula*, Quenst., which the author states distinctly to possess cardinal pits, and as the type specimen of this species displays a single extended cartilage pit, it cannot be referred to that genus. It has much analogy with *A. Deshayesi*, Terqm., but is much less oblique, has a smaller anterior wing, and an acute umbo, not being so concave a shell as that species. This species was referred by Portlock to *A. Goldfussi*. Several specimens from Craig and Gortmore form part of the Portlockian collection. The figured specimen I obtained from the Zone of "*A. angulatus*" at Island Magee.

The species is dedicated to my kind friend Robert Patterson, Esq., F.R.S.

14.—LEDA V-SCRIPTA, *nov. spec.*, Plate I. fig. 5.

Shell elliptical; anterior portion rounded, ventricose; posterior elongated, rostrated; ventral margin strongly arched; medial portion of shell ornamented by plications *en chevron;* the rostral and anterior extremities with oblique plaits.

Geological Position.—Zone of "*A. angulatus*" Waterloo, Larne. Very rare ; (*R. T.*)

15.—LEDA BRONNI, *Andler*, Neues Jarbuch f. Min., p. 642 (1858). See Plate I. fig. 1.

Nucula palmæ, Quenstedt, Jura, t. 13, fig. 42, p. 116, non t. 23, figs. 16.-17., t. 44., fig. 8. (1858).

This species resembles *L. subovalis* of the Middle Lias, from which it is especially distinguished, as pointed out by Andler, in the greater gibbosity of the umbonal region. It is common in the Zone of "*Belemnites acutus*" at Ballintoy, and occurs in the inferior zones. I have recorded it in England from the Zone of "*Ammonites Angulatus*" at Marton, Lincolnshire.

16.—LEDA QUENSTEDTI, *nov. spec.*, Plate I. fig. 4.

Nucula inflexa, Quenst., Jura, t. xiii., fig. 41, p. 110 (1858).

This species has been confounded by Quenstedt with *L. galathea*, d'Orbigny, a moderately common shell in the Middle Lias of England, France, and Germany, from which it is distinguished by its more robust and less inæquilateral form, and in the abruptly truncated posterior extremity.

Geological Position — Zones of "*A. planorbis*" Garron Point, and "*A. angulatus*," Island Magee, Co. Antrim (*R. T.*); Upper part Lower Lias, Ballintoy, Co. Antrim (*R. T.*) ; and Ofterdingen, Wurtemburg (*Quenstedt.*)

17. LEDA RENEVIERI, *Oppel*, Die Juraf., p. 95 (1857). See Plate I. fig 3.

Nucula complanata, Quenstedt, Jura, t. 13, fig. 39 ; p. 110 (1858).

The shell represented by fig 3, differs in a few particulars from the ordinary form of *L. tenuistriata*, Piette, but may be a young state of that species. Quenstedt's figure, which I have referred to, evidently represents the same species, which may be the one described by Oppel, in the following terms : —"Resembles *L. complanata*, Goldfuss, but does not attain the same size, and the anterior prolongation is shorter."

Geological Position. — Zone of "*A. Bucklandi*," Glynn, near Larne (*R. T.*) Recorded by Oppel in the Zone of "*A. angulatus*," and by Quenstedt, from the upper part of the Lower Lias in Swabia.

18. CUCULLÆA GRANGERI, *nov. spec.*, Plate I. fig. 12.

Cucullæa cucullata, Portlock, Geol. Survey of Derry, p. 120.

Shell ovate-rhomboidal, ventricose, rounded in front, and obliquely truncated behind, bluntly keeled from the umbo to the posterior angle ; umbones

submedial, prominent, broad, high, and incurved. Ornamented with concentric striæ, varying in the degree of fineness; and radiating striæ, which are very fine, not distinctly visible without the aid of a magnifier, excepting on the anterior concave area. The striæ merge into impressed circular spaces on the superior margin of the transverse striæ, so that the surface, when viewed in certain positions, appears to be regularly punctated. Length, ·35 inch; breadth, ·5.

This species is not comparable with any of the Liassic *Arcidæ*; its peculiar ornamentation separates it from *C. cucullata*, Goldfuss.

Geological Position—Upper part of Lower Lias, Ballintoy, Co. Antrim *(Portlock, R. T., &c.)*, where it is very abundant.

Dedicated to my esteemed friend the Rev. John Grainger, A.M., the first President of the Belfast Naturalists' Field Club.

19. MYTILUS SUBTILIS, *nov. spec.*, Plate I. fig. 14.

Shell elongated, reniform, concentrically plicated and ornamented with closely-set radiating incised lines, which are visible only with the aid of a magnifier; dorsal margin curved; ventral margin sinuated; umbones approximately terminal, prominent, small, incurved.

Geologial Position.—Lowermost beds of the Lower Lias, Cave Hill, Belfast; very rare *(S. A. Stewart)*. This species has the general form of *M. nitidulus*, Dunker, but is more cuneiform than that species, which does not possess the radial ornamentation.

20. MYOCONCHA OXYNOTI, *Quenstedt*, Jura, t. 13, fig. 34.

A single valve of a narrow cylindrical *Myoconcha*, forming part of the collection in the Belfast Museum, displays the internal characters, but as the exterior is unobservable, the shell cannot satisfactorily be referred to any species. Terquem describes a small species from the Lower Lias, and Quenstedt figures the internal cast of another form from the same formation, under the denomination of *M. oxynoti.*

The test of the Ballintoy specimen is very thin, and from the interior surface it is judged that the exterior is marked with concentric corrugations and fine lines of growths. The apparent absence of radiating lines removes it from *M. inclusa*, Terquem, and, as it agrees in shape with *M. oxynoti*, Quenstedt, I refer it to that problematical species.

Breadth, 1·4 inch; length, ·3 inch; thickness, ·1 inch.

Geological Position.—Zone of "*Belemnites acutus*," Ballintoy.

21. MYOCONCHA PSILONOTI, *Quenstedt*, Jura, t. 4, fig. 15 (1858).

? *Myoconcha scabra*, Terquem & Piette, Pal. de l'Est de France; t. 9, figs. 4-6 (1865).

? *Myoconcha scalprum*, *et M. spatula* (pars) D'Orbigny, Prodromus, Vol. I, p. 218 (1850).

I have no hesitation in referring the specimens named by D'Orbigny as above, and which I have examined, to *M. scabra* of Terquem & Piette, which I suspect is only the adult state of *M. psilonoti*. However, the Antrim shell agrees better with the latter. The species was known to Portlock, in whose collection it is labelled *Modiola, nov. spec.*

22. ASTARTE GUEUXII, *D'Orbigny*, Prodromus, Vol. I. p. 216 (1850).

A. consobrina, Chapuis & Dewalque, Foss. du. Luxembourg, t. 22, fig. 3, p. 49 (1853).

A. complanata, et A. psilonoti, Quenstedt, Jura, t. 3, fig. 14 (1858).

A. dentilabrum, Etheridge, Quart. Jour. Geol. Soc., Vol. xx., p. 113 (1863).

This common *Astarte* I have compared with the type specimens of *A. Gueuxii*, to which I unhesitatingly refer it. M. Terquem has named specimens of *A. dentilabrum*, which I sent him, *A. consobrina*; so that the synonymic terms may be considered well-established. Though D'Orbigny's name has priority of publication, it has not been generally accepted, because of the supposed incompleteness of the description, which runs thus :—"Species allied to *A. subtetragona*, Römer, but less carinated, less compressed, and costulated only in the young state."

Short as this diagnosis is, yet it is sufficient to its identification, and, consequently, the specific name *A. Gueuxii* should be used. *A. Eryx*, of the same author, is only a variety of this protean species; and *A. dentilabrum*, Etheridge, is founded on an aged form of the same species. The original description of *A. dentilabrum* is as follows :—"Shell massive, ovate, and deep. Postero-dorsal surface rounded, posterior end slightly truncate, about the position of the annal adductor to the ventral margin; anterior margin acutely rounded. Umbones small, indistinct, subcentral, slightly curved anteriorly. Lunule slightly excavated, small, oval, and attenuated, occupying half the area between the umbo and the commencement of the antero-ventral margin. Border angular; costæ concentrically arranged, and coincident with the contour of the shell. Ventral margin strongly denticulate. The whole of the teeth are inclined inwards, giving the edge of the shell a bevilled appearance—a marked feature in the shell."

23. PHOLADOMYA FRAASII, *Oppel*, Juraformation, p. 95.

The specific name here adopted was given by Oppel to a shell from the Lower Lias, agreeing in form with *P. ambigua*, Ziet., (*P. glabra*, Ag.), but possessing from 9 to 12 rather strong ribs, coarsely wrinkled concentrically. Quenstedt has described the same species in much the same words with the name *P. prima*, which, by the way, is a misnomer, inasmuch as the genus dates farther back than the Lower Lias, and other species besides occur in the lowest beds of the Lias.

24. CEROMYA GIBBOSA, *Etheridge*, Quart. Jour. Geol. Soc., Vol. xx., p. 112, figs. 3-4 (1863).

Isocardia Elea, D'Orbigny, Prodromus, Vol. 1., p. 218 (1850).

"Shell ventricose, deep, especially at the umbonal region. Umbones small, sub-central, slightly curved or involute, leaving a wide and exposed lunular region, strongly marked by concentric ridges of growth. Anterior side produced, rounded and gaping. Posterior side attenuated, slightly truncate. Ventral margin much produced, giving the shell a nearly circular appearance. Height, 1·7 inch; depth, 1·3 inch; length, 2·1 inches."—Etheridge.

The specific identity of *C. gibbosa*, Etheridge, with *Isocardia Elea*, d'Orbigny, results from a comparison of the type specimens; the diagnosis of the latter is so imperfect as to claim no consideration from palæontologists. It is as follows: —"Grosse espèce bombée, triangulaire lisse, à crochets contournés."

Geological Position. — Zone of "*A. angulatus*," Island Magee, Co. Antrim; not rare *(Gray, Tate)*; Cotham, Bristol! *(Napier)*; "*A. Bucklandi*" Zone, Lyme Regis! *(Coll. Geol. Soc.)*; Lower Lias, Langres, Haute-Marne! *(D'Orbigny.)*

25. THRACIA ÆQUATA, *nov. spec.*

Shell transversely oval, ventricose; umbones medial, obtuse; hinge line angulated; anterior extremity rounded; posterior extremity moderately obliquely truncated; a very faint keel proceeds from the umbo to the postero-ventral margin, ornamented with furrows and close set fine striæ, coincident with the ventral margin, which is arched. Breadth, ·55 inch; length, ·4 inch; thickness, ·25 inch.

It has much the shape of *T. lata*, Münster, from which it is distinguished especially by its ventricosity and curved front margin.

The genus *Thracia* has not yet been catalogued from English strata, older than the Inferior Oolite, and, indeed, if *Myacites mactroides*, Schlotheim, of the Lias, be not a Thracia, then the genus has till now been unknown below the Middle Lias. *T. rugosa*, Dunker, a Lower Lias shell, is considered to be a *Pleuromya*, and has been re-described as such under the name of *P. Dunkeri*, by Terquem, so that *T. æquata* is, at the present time, the oldest British example, if not the oldest-known species of the genus. I take this opportunity to announce the discovery, by Mr. E. Welford, of *T. glabra*, Agassiz, in the Upper Lias Clay at Eydon, where it was found associated with *Leda ovum*, *Inoceramus dubius*, and other species, which serve to fix its stratigraphical position in the Zone of "*Ammonites communis*."

Geological Position.—Zone of "*A. angulatus*," Waterloo, Larne. Specimen unique. (*R. T.*)

26. ANATINA MYACINA, *nov. spec.*. Plate I. fig. 16.

Shell oblong, elliptical, umbones sub-central, small, ventricose, recurved

posteriorly; anterior margin rounded, posterior produced, obliquely? truncated (the posterior margin is represented in the figure as complete; the shell is imperfect in this region).

An obtuse, ill-defined keel proceeds from the umbo to the lower posterior angle, another to the upper posterior angle, enclosing a broad, deeply-impressed lunular area. Marked by concentric plications and fine striæ, and close-set radiating granular lines. Length, ·75 inch; breadth, 1·5 inch; thickness, ·5 inch.

Geological Position.—Zone of "*A. angulatus*," Island Magee, Co. Antrim.

27. DISCINA HOLDENI, *Tate*, Quart. Jour. Geol. Soc., Vol. xxiii., p. 314 (1867). id. Geol. Mag., Vol. vi., p. 6 (1869).

Discina sp., Terquem and Piette. Lias Inf. de l'Est de France; t. xiv., figs. 33-34, p. 113 (1865).

Shell small, regularly conical, base orbicular, the length and breadth in the proportion of about 5 to 4; summit central; test concentrically striated; colour, black to brownish-black; yellowish-brown in the young shell. Dimensions of an averaged sized specimen:—Diameters, 4·5 and 3·6 millimetres; height, 2·3 millimetres.

D. Holdeni is distinguished from the other Liassic species of the genus by its regularly conical form and central apex; and from *D. reflexa*, Sowerby, with which it has been confounded by the latter character.

Geological Position.—Ranges from the Zone of "*Ammonites angulatus*" to that of "*Ammonites Ibex*," in England, and throughout the Lower Lias in the East of France.

28. POLLICIPES ALATUS, *nov. spec.* Plate I. fig. 6.

The single scutal plate here figured is the one to which Mr. Etheridge (Quart. Jour. Geol. Soc., Vol. xx., p. 114, 1863) applied the M.S. name of *P. liassicus*; but, as another species was described by Dunker with a similar denomination, *P. liasinus*, it appears to me advisable not to adopt Mr. Etheridge's provisional name. I, therefore, have selected that of *P. alatus*.

Scutum triangular, flat, apex acute with a lateral wing-like extension upon the oceludent side; basal margin outwardly curved; the tergal margin inflated. Exterior surface marked with regular raised lines coincident with the basal margin, and which are prolonged on the wing-like projection, and on the enrolled tergal margin.

Geological Position.—Zone of "*A. angulatus*," Island Magee, Co. Antrim. Specimen unique. (*R. T.*)

The following diagnoses of new species of Corals, type specimens of which were obtained from the Lower Lias in County Antrim, are extracted from Dr. Duncan's Monograph of British Fossil Corals. Pal. Soc., Vol. xx., 1868.

OPPELISMILIA, *Duncan*, loc. cit., p. 39.

Corallum simple, attached and conical; epitheca well-marked, and reaches to the calicular margin. Calice shallow, and the septa numerous and close. There are no costæ, and there is no columella. Gemmation occurs within the calice; and the bud, which has an epitheca, grows with the parent.

The genus includes *Montivaltiæ* with calicular gemmation.

29. OPPELISMIILIA GEMMANS, *Duncan*, loc. cit., t. x, figs. 33-34, p. 39.

Corallum short, with a broad and flat calice, an oval space at the base, where it was once adherent; a strong epitheca with circular markings, and there are no costæ. Calice flat and shallow, and its margin is sharp. The septa are very numerous and unequal. The bud on the calice has an epitheca, and its septa are faintly dentate.

Height of the corallum, 5-10ths inch; width of the calice, 9-10ths inch.

Locality—Waterloo, Larne. (*R. T.*)

30. MONTLIVALTIA HIBERNICA, *Duncan*, loc. cit., t. x, figs. 22-23, p. 39.

Corallum discoidal, base flat; calice convex. Epitheca of the base strongly marked concentrically. Septa numerous, close, unequal, and marked by small papillæ, which are very close together, and by flat eminences which are also very close together. There appear to be nearly five cycles of septa, and the largest septa are papillose. Diameter, 4-10ths inch; height of corallum, 1-10ths inch.

Locality.—West shore of Island Magee. (*R. T.*)

31. MONTLIVALTIA PAPILLATA, *Duncan*, loc. cit., t. x., figs. 15-18, p. 36.

Corallum cyclolitoid in shape, base slightly concave; calice convex, with a circular depression in the centre. Epitheca of the base reaching to the calicular margin; it is very thin, and marked with concentrical shallow depressions and elevations, and the costæ are seen through it faintly. The calice is nearly circular. The septa are exsert, and the larger have very large dentations or papillæ on them. There are 24 septa, which reach the margin of the columellary space, and they are strongly papillated. Between two of the longest septa there are three others, one, the central, is longer than the others, which are almost rudimentary; all are papillate.

Diameter—10-12ths inch; height of corallum, 2-10ths inch.

Locality—West shore of Island Magee (*R. T.*); it occurs, also, at Marton near Gainsborough, on the same horizon; associated with *M. Haimei*, Chap. & Dew., and *Septastræa Fromenteli*, Terq. & Piette, as in the Irish locality.

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11 FEB 1886

Explanation of Plate.

Fig. 1.—*Leda Bronni:* End view and side view, natural size.

" 2.—*Hinnites angularis:* Natural size.

" 3.—*Leda Renevieri:* Slightly enlarged.

" 4.—*Leda Quenstedti:* Natural size.

" 5.—*Leda v-scripta:* Natural size, and enlarged.

" 6.—*Pollicipes alatus:* Interior and exterior faces of a scutal plate, natural size.

" 7.—*Tornatella Robinsoni*: Slightly enlarged, and magnified view of upper part of body whorl.

" 8.—*Cerithium tenuicostatum:* Left hand figure, enlarged about two diameters; right hand figure, magnified view of one whorl.

" 9.—*Solarium Thomsoni:* Natural size, and three enlarged views.

" 10.—*Avicula Pattersoni:* Natural size.

" 11.—*Chemnitzia punctata:* Natural size, and magnified view of a portion of the test.

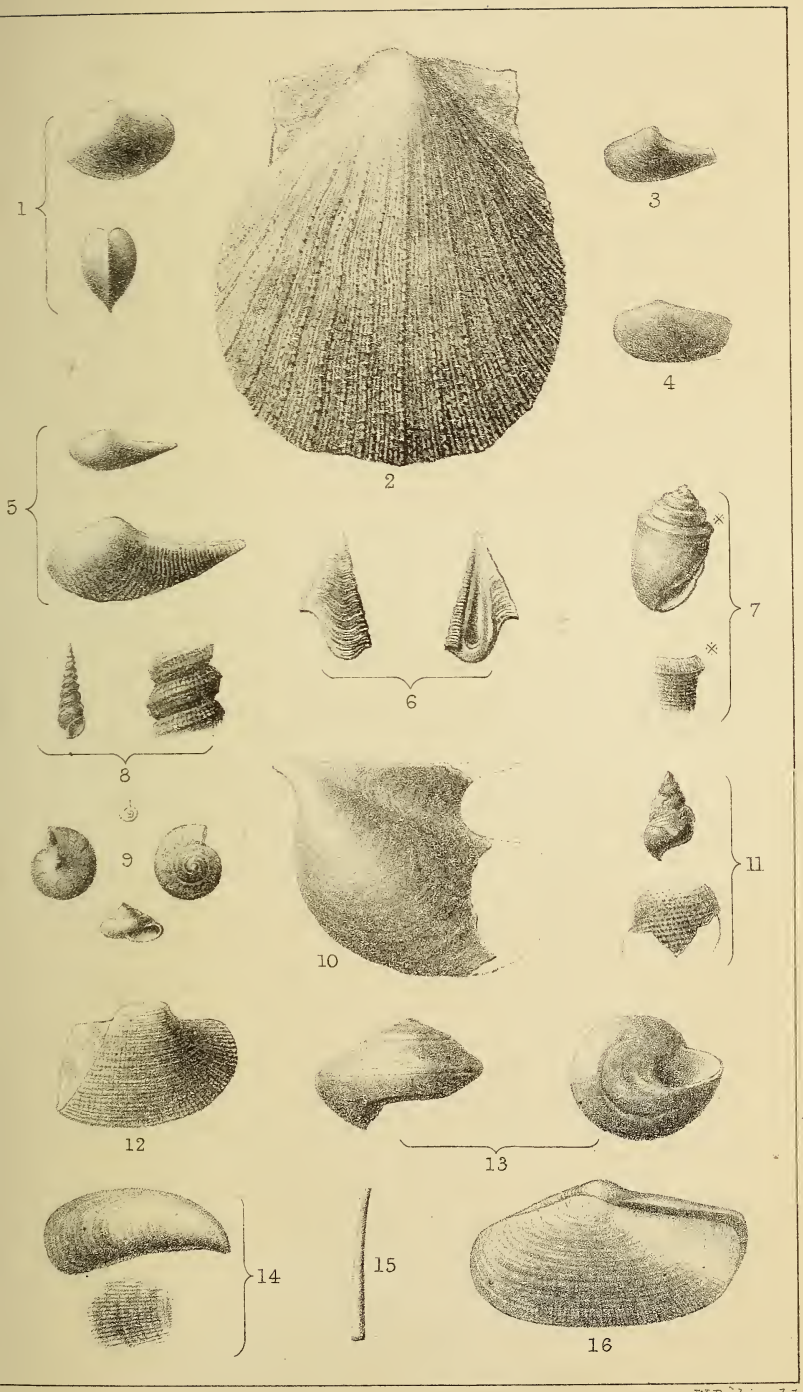
" 12.—*Cucullæa Grangeri:* Enlarged about one and a-half diameters.

" 13.—*Cryptænia Brycei:* Side view, and view of under surface, natural size.

" 14.—*Mytilus subtilis:* Natural size, and magnified view of a portion of the test.

" 15.—*Dentalium Portlocki:* Enlarged two diameters.

" 16.—*Anatina myacina:* Natural size.



W. Parkiss, del.

B.M.
NATURAL HISTORY

As it is intended to issue, from time to time, further Lists of the Fauna, Flora, Fossils, and Antiquities of the North of Ireland, Members are requested to preserve this Appendix for binding with those to be issued in the future.

APPENDIX II.

A LIST

OF THE

Irish Liassic Foraminifera,

BY

JOSEPH WRIGHT, F.G.S., F.R.G.S.I., Hrep

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc., &c., &c.;

AND

A LIST OF THE

FOSSILS OF THE ESTUARINE CLAYS,

OF THE COUNTIES OF DOWN AND ANTRIM,

BY

SAMUEL ALEX. STEWART, Hrep

Fellow of the Botanical Society of Edinburgh, Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

PUBLISHED BY

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OCTOBER, 1871.

BRITISH MUSEUM NATURAL

APPENDIX II.

ERRATA AND ADDENDA.

The paging after page 38 should be as follows:—Page 37 should be 39, 38 should be 40, 39 should be 41, 40 should be 42.

Page 26, line 4. For "Dr. H. P. Brady" read "Dr. H. B. Brady."

,, 29, line 5. For "*Convolvulus bidentatus*" read "*Conovulus bidentatus.*"

,, 29, line 18. For "LCUNA DIVARICATA" read "LACUNA DIVARICATA."

,, 29, line 20. For "LACUNA PALIDAUL" read "LACUNA PALIDULA."

,, 30, line 15. For "*scalaria Turtonis*" read "*Scalaria Turtonis.*"

,, 31, line 4. For "MUREX ERINACEOUS" read "MUREX ERINACEUS."

,, 32. line 29. For "TILUS ADRIATICUS VAR. OVALIS" read "MYTILUS ADRIATICUS, VAR. OVALIS." (In some copies only.)

,, 33, line 10. For "*Cardiam pygmœum*" read "*Cardium pygmœum.*"

,, 34, line 36. For "THRACIA PUBESCANS" read "THRACIA PUBESCENS."

,, 35, line 12. For "*Gastrochœnia modiolina*" read "*Gastrochœna modiolina.*

,, 35. After TEREBELLA CONCHILEGIA, add

ECHINUS MILIARIS, *Leske.* Very abundant in the *Thracia convexa* zone of the Belfast Estuarine Clay. Near the upper limit of this zone I found a bed marked by a closely-packed layer of the shells of this urchin. The shells are of large size. The species still lives abundantly in our bay.

AMPHIDOTUS CORDATUS, *Pennant.* Specimens of this "heart urchin" are scattered throughout the *Thracia convexa* zone in the Belfast bed, but not plentifully. This species occurs on the County Down coast, but I am not aware of its living in Belfast Lough. A sandy bottom is the *habitat* usually assigned to this urchin, but our fossil specimens must have lived on a bottom entirely muddy.

Page 36, line 2. For "SPIROLOCULINA PLANATULA" read "SPIROLOCULINA PLANULATA."

,, 36, line 3. For "TRILOCULINA BRONGNAIRATII" read "TRILOCULINA BRONGNIARTII."

,, 36, line 35. For "QUARTERNARY" read "QUATERNARY."

,, 38 line 17. For LITTORINA OBTUSATA, VAR. ÆSTUARU" read "LITTORINA OBTUSATA, VAR. ÆSTUARII."

,, 38 line 30. For "TURITTELLA TEREBRA" read "TURRITELLA TEREBRA."

,. 39 (37), line 16. For "MUREX ERINACEOUS" read "MUREX ERINACEUS."

,, 40 (31), line 3. For "OSTREA EDULIS, *Minn*," read "OSTREA EDULIS, *Linn*."

,, 41 (39), line 16. For "THRACIA PUBESCANS" read "THRACIA PUBESCENS."

A few typographical errors also appear, which are unnecessary to enumerate, as the correct reading will be apparent.

A LIST OF IRISH LIASSIC FORAMINIFERA,

BY

JOSEPH WRIGHT, F.G.S., F.R.G.S.I.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc., &c., &c.

Mr. R. Tate, in his valuable paper on the Liassic fossils of Ireland, published by the Club in 1870, records one species of Foraminifera, *Dentalina obliqua*, from the locality of Ballintoy, County Antrim. This is, I believe, the first, and, indeed, only notice we have of fossil Foraminifera having been met with in any of our Irish rocks.

Shortly after this paper appeared, Mr. W. Gray discovered two or three other Foraminifera in the same beds. On hearing of these discoveries I was led carefully to examine these shales at Ballintoy, in the hope of being able to add more kinds to the few already known from that station; and through the kindness of several members of the Club, who supplied me liberally with the stone, I am now able to give the names of no less than 20 species.

Excepting one spot on Island Magee, where *Lingulina tenera* has been met with, the Ballintoy shale is as yet the only Lias known in Ireland in which Foraminifera have been found. The shale at this place is singularly favourable for yielding these lovely little organisms, for on the stone being placed in water, it almost immediately falls down into a fine impalpable

mud, on passing which through fine muslin the Foraminifera remain behind in the very finest preservation.

I cannot conclude these few remarks without expressing my sincere thanks to Dr. H. P. Brady, F.L.S., of Newcastle-on-Tyne, for the very valuable assistance he afforded me in correctly determining the names of the species.

NODOSARIA RAPHANUS, *Linn.* sp. Ballintoy. Rare.
NODOSARIA SCALARIS, *Batsch.* sp. Ballintoy. Rare.
NODOSARIA TETRAGONA, *Reuss.* Ballintoy. Very common.
NODOSARIA BOUCANA, *D'Orb.* Ballintoy. Rare.
NODOSARIA HUMILIS, *Römer.* Ballintoy. Rare.
GLANDULINA LÆVIGATA, *D'Orb.* Ballintoy. Very rare.
LINGULINA TENERA, *Bornemann.* Ballintoy; Islandmagee. Very common.
DENTALINA COMMUNIS, *D'Orb.* Ballintoy. Common.
DENTALINA OBLIQUA, *Linn.* sp. Ballintoy. Very common.
VAGINULINA LEGUMEN, *Linn.* sp. Ballintoy. Very rare.
VAGINULINA LÆVIGATA, *Römer.* Ballintoy. Common.
VAGINULINA STRIATA, *D'Orb.* Ballintoy. Common.
MARGINULINA RAPHANUS, *Linn.* sp. Ballintoy. Very Common.
MARGINULINA LITUUS, *D'Orb.* Ballintoy. Rare.
MARGINULINA ENSIS, *Reuss.* Ballintoy. Common.
PLANULARIA BRONNI, *Römer.* Ballintoy. Rare.
CRISTELLARIA CREPIDULA, *F. & M.* sp. Ballintoy. Rare.
CRISTELLARIA ACUTAURICULARIS, *F. & M.* sp. Ballintoy. Very common,
FRONDICULARIA STRIATULA, *Reuss.* Ballintoy. Common.
FRONDICULARIA AUGUSTATA, *Nilsson.* Ballintoy. Common.

A LIST OF THE

Fossils of the Estuarine Clays of the Counties of Down and Antrim.

By SAMUEL ALEX. STEWART,

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The term, Estuarine Clay, is intended to signify those deposits, mostly of clay, which have been accumulated in our existing bays and estuaries since the close of the Glacial Period. They are the latest of the long series of geological deposits, and resting, as they most commonly do, on the Boulder Clay, they unite the present to the past.

The Estuarine Clay often presents beds of considerable thickness, which have been continuously laid down, and are tenanted by the shells of species that have lived and died on the spot. It is to be regretted that these beds have not received more attention, as they offer perhaps the best means of filling up the gap in geological history between the close of the Glacial Era and the present.

These Estuarine Clays are widely spread in Britain, being of considerable thickness, and covering areas of some extent in such important estuaries as those of the Clyde and of the Mersey. In the North of Ireland we have several of these beds. That at Belfast exceeds twenty feet in thickness, and is spread over an area of at least four or five square miles. It may be seen at Belfast, Sydenham, Holywood, Bangor, and Kilroot. Similar, though apparently less extensive Post-Pliocene accumulations, are to be found on the shores of the Loughs of Larne and Strangford, and also at Lough Foyle, and near Coleraine. Of the two latter no detailed account has been published, and I have had no opportunity of

examining them, though I have in my possession some of the shells from the Estuarine Clay of the Bann. In such inlets as those of Loughs Larne and Strangford, into which there are no rivers of any note carrying sediment, these Post-Pliocene clays are indicated by accumulations of small extent, but characterised by the presence of shells, in most part the same as those living in the adjoining waters.

A list of the Belfast clay shells was made out by John Grainger, Esq., and published by the British Association in their Report for 1852. A second list by Mr. Grainger, recording all the species known to occur in this bed at that date, was published in the *Natural History Review* for 1859. By the excavations for the recently constructed floating dock and basin, I have been enabled to examine this clay to a depth of twenty feet over a considerable area. The results are the addition of a goodly number of species to Mr. Grainger's lists, and the conviction that there is evidence that since the basement portion of that clay was laid down, there have been several oscillations of the sea-level; these oscillations can be shown by a comparison of the different sets of shells, found at various depths in the clay.

The Larne Lough Estuarine Clay may be seen on the shore close to Magheramorne railway station: shells occur in it abundantly, many of the *testacea* being among our rarer species. This deposit is rich in *Foraminifera*, and in the smaller forms of Mollusca, especially univalves. It has been only slightly examined, and would doubtless yield many more fossils if scrutinised as closely as the corresponding bed at Belfast. At Strangford Lough I have seen the Estuarine clay near Newtownards, but have had little opportunity of investigating the bed at that place.

ANNOTATED LIST OF SPECIES.*

HELIX NEMORALIS. Mr. Grainger records the finding of one specimen of this land shell. I met with it two or three times.

HELIX ROTUNDATA. One specimen (Grainger).

ZONITES NITIDULUS. Two specimens (Grainger).

MELAMPUS BIDENTATUS, *Convolvulus bidentatus*, F. & H. Larne Lough bed, rare.

PATELLA VULGATA. One specimen (Grainger).

TECTURA VIRGINEA, *Acmæa virginea*, F. & H. Very rare. (One young specimen.)

FISSURELLA GRÆCA, *Fissurella reticulata*, F. & H. Belfast bed, rare.

CYCLOSTREMA NITENS, *Trochus pusillus*, F. & H. Plentiful in the Larne Lough deposit.

TROCHUS MAGUS. Of large size, but rare.

TROCHUS CINERAREUS. Abundant both at Belfast and Larne.

TROCHUS UMBILICATUS. At Larne Lough, scarce and small.

LACUNA CRASSIOR. Found by Mr. Grainger in the Estuarine Clay of Belfast. I have not myself met with specimens.

LCUNA DIVARICATA, *Lacuna vincta*, F. & H. Occurs in some plenty.

LACUNA PUTEOLUS. Larne Lough, scarce.

LACUNA PALLIDAUL. In the Larne Lough deposits, scarce.

LITTORINA OBTUSATA, *Littorina litoralis*, F. & H. Frequent.

LITTORINA OBTUSATA, VAR. ÆSTUARII. Belfast, rare.

LITTORINARUDIS. Scarce.

LITTORINA RUDIS, VAR. TENEBROSA. Scarce.

LITTORINA LITOREA. Abundant, especially in the † Scrobicularia bed.

RISSOA INCONSPICUA. In great abundance.

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* I have used the names adopted by Mr. Jeffreys in his Manual of British Conchology. Where the names given by Forbes and Hanley are different, they appear here as synonyms.

† See abstract of paper read by the author on 8th March, in Eighth Annual Report of Belfast Naturalists' Field Club (1871).

RISSOA MEMBRANACEA, *Rissoa labiosa*, F. & H. Profusely abundant, and of large size.

RISSOA VIOLACEA, *Rissoa rufilabrum*, F. & H. Not uncommon.

RISSOA STRIATA. Larne Lough, in profusion.

RISSOA VITREA. In the Belfast deposit, rare.

HYDROBIA ULVÆ, *Rissoa ulvæ*, F. & H. Frequent in the Estuarine Clays of Belfast, Larne, and Strangford Loughs.

HOMALOGYRA ATOMUS, *Skenea nitidissima*, F. & H. Abundant in the clay at Magheramorne.

HOMALOGYRA ROTA, *Skenea rota*, F. & H. With the last species, but rare.

CÆCUM GLABRUM. Larne Lough, rare.

TURITELLA TEREBRA, *Turitella communis*, F. & H. Plentiful, and very large.

SCALARIA TURTONÆ, *scalaria Turtonis*, F. & H. Plentiful in the Belfast bed.

ACLIS SUPRANITIDA. Belfast bed, very rare.

ODOSTOMIA MINIMA. This rare little univalve is for the first time recorded as an Irish Shell. One specimen only occurred to me.

ODOSTOMIA PALLIDA, *Odostomia eulimoides*, F. & H. Mr. Grainger recorded this shell from the Belfast deposit. I have found it at Magheramorne, where it is rather scarce.

ODOSTOMIA ACUTA. Belfast and Larne beds, rare.

ODOSTOMIA INDISTINCTA, *Chemnitzia indistincta*, F. & H. Rare.

ODOSTOMIA INTERSTINCTA. Very rare.

ODOSTOMIA LACTEA, *Chemnitzia elegantissima*, F. & H. Belfast and Larne beds, not uncommon.

EULIMA BILINEATA. One specimen found by Mr. Grainger, and recorded as *E. subulata*. Dr. Grainger is now satisfied that the name I have adopted is right.

NATICA CATENA, *Natica monilifera*, F. & H. Very scarce.

NATICA ALDERI, *Natica nitida*, F. & H. Commonly diffused through the clay.

APORRHAIS PES-PELICANI. In the greatest abundance.

CERITHIUM RETICULATUM. Everywhere throughout the deposit in abundance.

PURPURA LAPILLUS. A few specimens occurred, but this species may be reckoned among the rare shells of the Estuarine Clay.

BUCCINUM UNDATUM. Very common.

MUREX ERINACEOUS. Rare at Belfast, rather frequent at Larne.

FUSUS ANTIQUUS. Occurs occasionally, but not at all common.

NASSA RETICULATA. Frequent throughout the Clays.

NASSA PYGMEA. Very common. Mr. Grainger's *N. incrassata* belongs, I believe, to this "segregate." The distribution of these forms in our local Post-tertiary deposits seems to have been very fluctuating. *Nassa incrassata* occurs in our Glacial Clays, then disappears from our subsequently deposited Estuarine Clay, and finally reappears as the dominant form in our existing waters. *Nassa pygmea*, on the other hand, has not been found in our Boulder Clay, but in the Estuarine Clay is abundant, and now again ranks as a rare shell confined to the deep waters outside the bay.

DEFRANCIA GRACILIS, *Mangelia gracilis*. F. & H. Very rare, one specimen only.

PLEUROTOMA COSTATA, *Mangelia costata*. F. & H. One specimen, (*fide* Grainger).

PLEUROTOMA BRACHYSTOMA, *Mangelia brachystoma*. F. & H. Rather rare.

PLEUROTOMA SEPTANGULARIS, *Mangelia septangularis*. F. & H. Very rare.

PLEUROTOMA RUFA, *Mangelia rufa*, F. & H. "Belfast deposit" (J. Gwyn Jeffreys). By the Belfast deposit, I believe Mr. Jeffreys means our bed of Estuarine Clay. Nevertheless, few discriminate sufficiently between the Estuarine Clay and the raised beaches occurring here. The latter I have excluded from my list.

PLEUROTOMA TURRICULA, *Mangelia turricula*. F. & H. Rare.

CYPRÆA EUROPÆA. Two or three specimens only of our British cowry occurred to me.

CYLICHNA NITIDULA. In the Belfast bed I found one shell.

UTRICULUS OBTUSUS, *Cylichna obtusa*. F. & H. In the Larne, and also in the Strangford Lough Estuarine Clay, rare.

UTRICULUS HYALINUS, *Amphisphyra hyalina*, F. & H. Plentiful in the Belfast and in the Larne beds, but so fragile that specimens can scarcely be secured.

ACERA BULLATA, *Akera bullata*, F. & H. In the Belfast bed abundantly, but restricted to the *zone of *Thracia convexa*. Plentiful also at Larne, where specimens are of small size, apparently the variety *nana*.

ACTÆON TORNATILIS, *Tornatella fasciata*, F. & H. Belfast deposit, (*fide* Grainger).

SCAPHANDER LIGNARIUS. Rare. Three or four specimens only.

PHILINE APERTA. In abundance.

ANOMIA EPHIPPIUM. This extremely variable shell is distributed throughout the clay in some plenty.

ANOMIA PATELLIFORMIS. Rare, (Grainger).

OSTREA EDULIS. Shell beds, made up nearly altogether of the common oyster, occurred near the base of the deposit, and again repeated near the upper surface.

OSTREA EDULIS, VAR. HIPPOPUS. Immense shells of this deep-water variety scattered through the clay, mainly in the median portion of the deposit.

PECTEN VARIUS. Generally distributed and abundant.

PECTEN OPERCULARIS. Along with the last species, and almost equally abundant.

PECTEN MAXIMUS. Scattered throughout, rather plentifully.

LIMA HIANS. Very rare in the Belfast bed, abundant in the corresponding deposit in Larne Lough.

MYTILUS EDULIS. Abundant, especially in the basal and superficial portions of the clay.

MYTILUS MODIOLUS, *Modiola modiolus*, F. & H. Rare at Belfast, plentiful in the Larne bed.

MYTILUS ADRIATICUS, *Modiola tulipa*, F. & H. Occurs both at Belfast and Larne, but is rare.

TILUS ADRIATICUS, VAR. OVALIS. "Occurred in excavating a channel in Belfast Harbour" (J. G. Jeffreys). Some specimens dug out at the site of the new floating dock appear to belong to this variety.

MODIOLARIA MARMORATA, *Crenella marmorata*, F. & H. Very rare at Belfast, frequent at Larne.

NUCULA NUCLEUS. Very abundant in the Belfast beds; rare at Larne.

LEDA MINUTA, *Leda caudata*, F. & H. A single valve, (Grainger).

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* See abstract of paper read by the author on 8th March, in Eighth Annual Report of Belfast Naturalists' Field Club (1871).

MONTACUTA BIDENTATA. Frequent at Belfast; occurs in the Larne Lough bed in profusion.

MONTACUTA FERRUGINOSA. In the Belfast bed, rare.

LUCINA BOREALIS. Belfast bed, rare, but very large and tumid. The normal form occurs abundantly in the Larne Lough deposit.

AXINUS FLEXUOSUS, *Lucina flexuosa*, F. & H. Abundant and luxuriant.

CYAMIUM MINUTUM, *Turtonia minuta*, F. & H. Rare in the Belfast Estuarine Clay, plentiful in the similar bed at Larne Lough.

CARDIUM ECHINATUM. Occurs in great profusion, and very fine.

CARDIUM EXIGUUM, *Cardiam pygmæum*, F. & H. Occurs rather frequently in the Belfast deposit, but generally as single valves. More plentiful at Larne, and often complete.

CARDIUM NODOSUM. In the Larne Lough bed, very rare.

CARDIUM EDULE. Very abundant, especially in the upper and lower zones. Some of the shells, if not fully entitled to be considered as belonging to the variety *rusticum*, certainly approach that estuarine form very closely.

CARDIUM NORVEGICUM. Very rare. Mr. Grainger found one valve, and two or three valves occurred to me.

CYPRINA ISLANDICA. Very rare. I found one perfect specimen in the *Thracia convexa* zone of the Estuarine Clay.

VENUS LINCTA, *Artemis lincta*, F. & H. Occurs occasionally dispersed through the clay, but usually in single valves.

VENUS CASINA. Frequent in the Larne Lough deposit, mostly in single valves.

VENUS OVATA. Frequent at Larne, specimens small.

VENUS GALLINA, *Venus striatula*, F. & H. Diffused through the beds, form variable.

TAPES AUREUS. Common in the Larne Estuarine bed, not rare in the Belfast bed.

TAPES AUREUS, VAR. OVATA. Not uncommon, occurs both in the Larne and Belfast Estuarine Clays; attains a much greater size than the typical form.

TAPES PULLASTRA. Frequent, especially in the lower zone.

TAPES DECUSSATA. Shells of this littoral species occupy the lower portion of the clay in great profusion. Many specimens were much above the usual size.

LUCINOPSIS UNDATA. Very large, and diffused in immense numbers through the clay, except in the very oldest and very newest portions of the bed.

TELLINA BALTHICA, *Tellina solidula*, F. & H. Abundant, especially near the upper surface.

TELLINA TENUIS. Near the top, only sparingly, and of small size.

TELLINA SQUALIDA, *Tellina incarnata*, F. & H. Very rare. The only specimens I have seen were single valves collected by the late Wm. Thompson, Esq., and by Mr. William Darragh, of the Belfast Museum.

PSAMMOBIA FERROENSIS. Single valves frequent, perfect specimens rare.

PSAMMOBIA VESPERTINA. Mr. Grainger records finding a single valve of this species.

MACTRA SUBTRUNCATA. Frequent, variable in size and shape.

MACTRA TRUNCATA. Scarce.

LUTRARIA ELLIPTICA. Frequent.

LUTRARIA OBLONGA. One specimen, (*fide* Grainger).

SCROBICULARIA ALBA, *Syndosmya alba*, F. & H. Scattered through the clay in immense numbers.

SCROBICULARIA PIPERATA. Occupies the lower zone of the clay in the greatest profusion, Rare or absent from the higher or more recently deposited portion of the bed.

SOLECURTIS ANTIQUATUS, *Solecurtis coarctatus*, F. & H. A single specimen, (*fide* Grainger).

SOLEN PELLUCIDUS. Distributed through the median portion of the bed in abundance.

SOLEN ENSIS. Occurs sparingly.

SOLEN VAGINA, *Solen marginatus*, F. & H. Rather frequent.

THRACIA PAPYRACEA, *Thracia phaseolina*. Frequent; shells often perfect. The form *T. villosiuscula* also occurs.

THRACIA CONVEXA. Perfect specimens of this fine shell are plentiful; their occurrence made it easy to recognise a well-marked zone of the clay, replete with species that live mostly at a depth of five to ten fathoms.

THRACIA PUBESCANS. One specimen. (Grainger).

CORBULA GIBBA, *Corbula nucleus*, F. & H. Plentiful, but mostly as single valves.

MYA ARENARIA. Frequent, but only in the most recent portion of the bed.

MYA TRUNCATA. Plentiful throughout; specimens very fine, and sometimes with the siphonal tubes preserved.

MYA BINGHAMI, *Sphænia Binghami*, F. & H. In the Larne Lough deposit, very rare.

PANOPEA PLICATA, *Saxicava rugosa*, young? F. & H. Plentiful at Belfast in one narrow zone of the clay bed. Not yet found living on the Irish coasts.

SAXICAVA RUGOSA. Larne Lough deposit, rare.

SAXICAVA RUGOSA VAR. ARTICA. Belfast bed, rare (Grainger).

GASTROCHÆNA DUBIA, *Gastrochænia modiolina*, F. & H. "Two portions of the curious flask-like tubes of this species were found in the deposits" (Grainger).

PHOLAS CANDIDA. Perfect shells imbedded in numbers at the base of the zone of *Thracia convexa*, and forming a line of demarcation between that zone and the *Scrobicularia* bed.

PHOLAS CRISPATA. In the clay where they had lived in some numbers; the specimens are very large, many of them being nearly double the usual dimensions of living examples. They occur only at the base of the *Thracia convexa* bed.

TEREDO NORVEGICA. The calcareous tubes of this "ship worm" are not rare in the clay; complete specimens now in the Belfast Museum were dug up while making sewers in the streets of the town.

CREUSIA VERRUCA. Belfast deposit, (Grainger).

CYTHERE ALBO-MACULATA. Belfast bed, rare. Not rare in the Larne Lough deposit.

PECTINARIA BELGICA. Belfast deposit, (Grainger.)

SERPULA TRIQUETRA. Belfast Estuarine Clay, on shells.

SERPULA VERMICULARIS. In the Belfast Clay, rare.

TEREBELLA CONCHILEGA. Belfast bed, (Grainger.)

POLYMORPHINA LACTEA. Rare.

POLYMORPHINA GIBBA, *Var. æqualis*. Rare.

PLANORBULINA MEDITERRANENSIS. Very rare.

POLYSTOMELLA CRISPA. Belfast and Larne bed, very abundant.

QUINQUELOCULINA BICORNIS. Belfast and Larne beds, scarce.

QUINQUELOCULINA SEMINULUM. In great abundance.

ROTALIA BECCARII. Extremely abundant, Belfast and Larne Lough.

SPIROLOCULINA LIMBATA. Rare.

SPIROLOCULINA PLANATULA. Very rare.

TRILOCULINA BRONGNAIRTII. Rare.

TRILOCULINA TRIGONULA. Common.

TRUNCATULINA LOBATULA. Not common.

VERNEUILINA POLYSTROPHA? Very rare.

In the foregoing list I have given estimates for the several species, approximating as near as possible to the abundance or paucity of specimens. These estimates are founded on careful observations, extending over some three years. In preparing them I have derived valuable assistance from Dr. Grainger's previously published lists, and I am confident that they may be relied on as in the main correct. Future excavations, if such be carried on in these beds, may possibly make slight modifications, but I am satisfied that on the whole the estimates here given will remain practically undisturbed.

In the table which follows, I have endeavoured to give for the North of Ireland the distribution of these species in Post-tertiary times. Unfortunately the unproductiveness of our Glacial beds renders one column rather imperfect. Out of 140 species here recorded, only 29, being 21 per cent., appear as glacial shells in this district. It cannot be doubted but that there existed a much greater community between the two *faunas*.

Species make their appearance in a locality, becoming more and more abundant until they reach their culminating point, from which they recede with more or less rapidity until finally they are replaced by others. Such is the history of many of the shells of our Estuarine Clay, and to make this record as useful and complete as possible, columns are here given, showing those now found living in the waters of our bay, and those living at present on the coasts of the North of Ireland, distinguishing them from such as have only been found as dead shells. These columns will, it is hoped, prove instructive. It will be seen that many species, now only found dead, existed here during some portion of the Estuarine Clay times in abundance; and it may be added that during that period some other species, now among the forms dominant in our waters, were either absent or rare.

Shells from Raised Beaches, and Quarternary Gravels, are not included in these lists, which have been rigidly restricted to species which certainly occur in the Estuarine Clay. Many Post-pliocene shells are thereby excluded, which have been recorded as from Belfast deposits. It is to be

hoped that members of the Belfast Naturalists' Field Club will not overlook the raised beaches that are so numerous in the district: a good catalogue of our raised beach shells would nearly perfect our knowledge of the local Post-pliocene marine *fauna*.

I am very much indebted to J. Gwynn Jeffreys. Esq., F.R.S., for his kindness in identifying for me all critical or doubtful shells; to Joseph Wright, Esq., F.G.S., who gave much valuable assistance in ascertaining the various forms of *Foraminifera* in the Estuarine Clay; and also to Dr. H. B. Brady, F.G.S., F.L.S., who kindly took the trouble to refer these forms to their proper species. To Rev. Dr. Grainger I am also indebted for permission to examine his valuable collections of shells of the Belfast Estuarine Clay.

TABLE OF LOCAL DISTRIBUTION.

List of Species.*	Fossil				Recent			
					Living		Dead Shells	
	Glacial Clay	Belfast Estuarine Clay	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland
GASTROPODA.								
Helix nemoralis, *Müll.*	..	x.	..	..	..	..	..	..
Helix rotundata, *Linn*	..	x.	..	..	..	..	..	..
Zonites nitidulus, *Drap.*	..	x.	..	..	..	..	..	..
Melampus bidentatus, *Mont*	..	..	x.	..	x.	x.	..	..
Patella vulgata, *Linn*	..	x.	..	..	x.	x.	..	..
Tectura virginea, *Mull.*	..	x.	..	..	x.	x.	..	..
Fissurella Græca, *Linn*	..	x.	..	..	x.	x.	..	..
Cyclostrema nitens, *Phil*	..	..	x.	..	..	..	x.	..
Trochus magus, *Linn*	..	x.	x.	..	x.	x.	..	..
Trochus cinerarius, *Linn.*	..	x.	x.	..	x.	x.	..	..
Trochus umbilicatus, *Mont*	..	..	x.	..	x.	x.	..	..
Lacuna crassior, *Mont*	..	x.	..	..	x.	x.	..	..
Lacuna divaricata, *Fabr*	..	x.	x.	..	x.	x.	..	..
Lacuna puteolus, *Turt*	..	..	x.	..	..	..	x.	x.
Lacuna pallidula, *Da Costa*	..	x.	x.	..	x.	x.	..	..
Littorina obtusata, *Linn*	..	x.	x.	x.	x.	x.	..	..
,, var, æstuaru, *Jeff*	..	x.	..	..	..	..	..	..
Littorina rudis, *Maton*	..	x.	..	x.	x.	x.	..	..
" var, tenebrosa, *Mont*	..	x.	..	..	x.	x.	..	..
Littorina litorea, *Linn*	x.	x.	x.	x.	x.	x.	..	..
Rissoa inconspicua, *Ald*	..	x.	x.	..	..	..	x.	x.
Rissoa membranacea *Adams*	..	x.	x.	..	x.	x.	..	..
Rissoa violacea, *Desm*	..	x.	x.	..	x.	..	..	x.
Rissoa striata, *Adams*	..	..	x.	..	x.	x.	..	..
Rissoa vitrea, *Mont*	..	x.	..	..	..	..	x.	..
Hydrobia ulvæ, *Penn*	..	x.	..	x.	x.	x.	..	..
Homalogyra atomus, *Phil*	..	..	x.	..	..	x.	..	..
Homalogyra, rota, *F. & H*	..	..	x.	..	..	..	..	x.
Cæcum glabrum, *Mont*	..	..	x.	..	..	..	x.	..
Turittella terebra, *Linn*	x.	x.	x.	..	x.	x.	..	..

* I have placed each species in the column for dead shells, unless there is some record of them being taken alive, or that I myself know of their living here.

List of Species.	Fossil.				Recent.			
					Living		Dead Shells	
	Glacial Clay	Belfast Estuarine Clay.	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland
GASTROPODA.								
Scalaria Turtonæ, *Turt*	..	x.	..	..	..	..	..	x.
Aclis supranitida, S. *Wood*	..	..	x.	..	..	..	x.	x.
Odostomia minima, *Jeff*	..	..	x.	..	..	..	..	..
Odostomia pallida, *Mont*	..	..	x.	..	x.	x.	..	..
Odostomia acuta, *Jeff*	..	x.	x.	..	..	..	x.	..
Odostomia indistincta, *Mont*	..	x.	..	..	..	..	x.	x.
Odostomia interstincta, *Mont*	..	x.	..	..	..	..	x.	x.
Odostomia lactea, *Linn*	..	x.	x.	..	..	..	x.	x.
Eulima bilineata, *Ald*	..	x.	..	..	..	x.	x.	..
Natica catena, *Da Costa*	x.	x.	..	..	..	..	x.	x.
Natica Alderi, *Forbes*	..	x.	..	..	x.	x.	..	..
Aporrhais pes-pelicani, *Linn*	x.	x.	..	..	x.	x.	..	..
Cerithium reticulatum, *Da Costa*	..	x.	x.	x.	x.	x.	..	..
Purpura lapillus, *Linn*	x.	x.	..	..	x.	x.	..	..
Buccinum undatum, *Linn*	x.	x.	x.	..	x.	x.	..	..
Murex erinaceous, *Linn*	x.	x.	x.	..	x.	x.	..	..
Fusus antiquus, *Linn*	x.	x.	..	..	x.	x.	..	..
Nassa reticulata, *Linn.*	x.	x.	..	..	x.	..	..	..
Nassa pygmea, *Lamk*	..	x.	..	..	x.	..	..	..
Defrancia gracilis, *Mont*	..	x.	..	..	..	..	..	..
Pleurotoma costata, *Donovan*	..	x.	..	..	..	..	x.	x.
Pleurotoma brachystoma, *Phil*	..	x.	..	..	..	..	..	x.
Pleurotoma septangularis, *Mont*	..	x.	..	..	x.	x.	..	..
Pleurotoma rufa, *Mont*	..	x.	..	..	x.	..	..	x.
Pleurotoma turricula, *Mont*	x.	x.	..	.	..	..	x.	x.
Cypræa Europæa, *Mont*	x.	x.	x.	..	x.	x.	..	..
Cylichna nitidula, *Lov*	..	x.	..	..	..	..	..	x.
Utriculus obtusus, *Mont*	..	..	x.	x.	..	..	x.	x.
Utriculus hyalinus, *Turt*	..	x.	x.	..	..	..	..	x.
Acera bullata, *Mull*	..	x.	x.	..	x.	x.	..	..
Actæon tornatilis, *Linn*	..	x.	..	..	..	..	x.	x.
Scaphander lignarius, *Linn*	..	x.	..	..	x.	..	..	x.
Philine aperta, *Linn*	..	x.	..	..	x.	..	..	..

List of Species.	Fossil.				Recent.			
					Living.		Dead Shells.	
	Glacial Clay	Belfast Estuarine Clay	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland
CONCHIFERA.								
Anomia ephippium, *Linn*	..	x.	x.	..	x.	x.	..	..
Anomia patelliformis, *Linn*	..	x.	..	..	x.	x.	..	..
Ostrea edulis, *Minn*	x.	x.	x.	x.	x.	x.	..	..
,, ,, var. hippopus, *Lamk*	..	x.	..	..	x.	..	..	..
Pecten varius, *Linn*	..	x.	x.	..	x.	x.	..	..
Pecten opercularis, *Linn*	..	x.	x.	..	x.	x.	..	..
Pecten maximus, *Linn*	x.	x.	x.	..	x.	x.	..	..
Lima hians, *Gmel*	..	x.	x.	..	..	x.	x.	..
Mytilus edulis, *Linn*	x.	x.	x.	x,	x.	x.	..	..
Mytilus modiolus, *Linn*	..	x.	x.	..	x.	x.	..	..
Mytilus Adriaticus, *Lamk*	..	x.	x.	..	x.	x.	..	..
Modiolaria marmorata, *Forbes*	..	x.	x.	..	x.	x.	..	..
Nucula nucleus, *Linn*	x.	x.	x.	..	x.	x.	..	..
Leda minuta, *Müll*	..	x.	..	..	x.	x.	..	..
Montacuta bidentata, *Mont*	..	x.	x.	..	..	..	x.	x.
Montacuta ferruginosa, *Mont*	..	x.	..	..	..	..	x.	x.
Lucina borealis, *Linn*	..	x.	x.	..	..	x.	x.	..
Axinus flexuosus, *Mont*	..	x.	x.	..	..	..	x.	x.
Cyamium minutum, *Fabr.*	..	x.	x.	..	x.	x.	..	..
Cardium echinatum, *Linn*	x.	x.	..	..	x.	x.	..	..
Cardium exigium, *Gmel*	..	x.	x.	..	..	x.	x.	..
Cardium nodosum, *Turt*	x.	..	x.	..	x.	x.	..	..
Cardium edule, *Linn*	x.	x.	x.	x.	x.	x.	..	..
Cardium Norvegicum, *Speng*	..	x.	..	..	x.	..	..	x.
Cyprina Islandica, *Linn*	x.	x.	..	..	x.	x.	..	..
Venus lincta, *Pult*	..	x.	..	..	..	x.	x.	..
Venus casina, *Linn*	..	..	x,	..	x.	x.	..	..
Venus ovata, *Penn*	x.	..	x.	..	x.	x.	..	..
Venus Gallina, *Linn.*	x.	x.	x.	..	x.	x.	..	..
Tapes aureus, *Gmel*	x.	x.	x.	x.	x.	..	..	x.
,, ,, var. ovata, *Jeff*	..	x.	x.	..	..	.	..	..
Tapes pullastra, *Mont*	..	x.	..	..	x.	x.	..	..
Tapes decussatus, *Linn*	x.	x.	x.	..	..	..	x.	..
Lucinopsis undata, *Penn*	..	x.	..	..	..	..	x.	x.
Tellina balthica, *Linn*	x.	x.	..	..	x.	x.	..	..

List of Species.	Fossil.				Recent.			
					Living		Dead Shells	
	Glacial Clay	Belfast Estuarine Clay	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland
CONCHIFERA.								
Tellina tenuis, *Da Costa*	..	x.	..	..	x.	x.	..	..
Tellina squalida, *Pult*	..	x.	..	..	..	..	x.	x.
Psammobia ferroensis, *Chemn*	..	x.	..	..	..	..	x.	x.
Psammobia vespertina, *Chemn*	..	x.	..	..	..	..	..	x.
Mactra truncata, *Mont*	x.	x.	..	..	x.	x.	..	..
Mactra subtruncata, *Da Costa*	x.	x.	..	x.	x.	x.	..	..
Lutraria elliptica *Lamk*	..	x.	..	..	..	x.	x.	..
Lutraria oblonga. *Chemn*	..	x.	..	..	..	..	..	x.
Scrobicularia alba, *Wood*	..	x.	x.	..	x.	x.	..	..
Scrobicularia piperata, *Bellonius*	..	x.	..	..	..	..	..	..
Solecurtus antiquatus, *Pult*	..	x.	..	..	..	..	x.	x.
Solen pellucidus, *Penn*	..	x.	x.	..	x.	x.	..	..
Solen ensis. *Linn*	..	x.	..	..	x.	x.	..	..
Solen vagina, *Linn*	..	x.	..	..	..	..	x.	..
Thracia papyracea *Poli*	..	x.	..	..	..	..	x.	x.
Thracia pubescans, *Pult*	..	x.	..	..	..	..	x.	..
Thracia convexa, *W. Wood*	..	x.	..	..	..	..	x.	x.
Corbula gibba, *Olivi*	..	x.	x.	..	x.	x.	..	..
Mya arenaria, *Linn*	..	x.	..	..	x.	x.	..	..
Mya truncata, *Linn*	..	x.	..	..	x.	x.	..	..
Mya Binghami, *Turt*	..	..	x.	..	x.	..	..	..
Panopea plicata, *Mont*	..	x.	..	..	..	..	..	..
Saxicava rugosa, *Linn*	x.	x.	x.	..	x.	x.	..	..
,, ,, var. arctica, *F. & H.*	..	x.	..	..	x.	x.	..	..
Gastrochæna dubia, *Penn*	..	x.	..	..	..	..	..	..
Pholas candida, *Linn*	..	x.	..	..	x.	..	..	..
Pholas crispata, *Linn*	x.	x.	..	..	x.	..	..	..
Teredo Norvegica, *Speng*,	..	x.	..	..	..	..	x.	..
Class CRUSTACEA								
Cythere albo-maculata,	..	x.	x.	..	..	..	..	..
Creusia verruca, *Leach*	..	x.	..	..	..	x.	..	..
Class ANNELIDA								
Pectinaria belgica, *Pall*	..	x.	..	..	..	x.	..	..

List of Species.	Fossil.				Recent.			
					Living		Dead Shells	
	Glacial Clay	Belfast Estuarine Clay	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland.
Class ANNELIDA.								
Serpula vermicularis *Linn*	x.	x.	..	..	x.	x.	..	..
Serpula triquetra, *Linn*	..	x.	..	..	x.	x.	..	..
Terebella conchilega, *Pall*	..	x.	..	..	x.	x.	..	..
*Class RHIZOPODA.								
Polymorphina lactea, *W. & J.*	..	..	x.	..	..	..	x.	..
Polymorphina gibba, var. equalis, *W. & J.*	..	x.	x.	..	..	..	..	..
Planorbulina Mediterranensis, *D'Orb*	..	..	x.	.	..	..	..	..
Polystomella crispa, *Linn*	..	x.	x.	..	..	..	x.	..
Quinqueloculina bicornis, *W. & J.*	..	x.	x.	..	..	..	x.	..
Quinqueloculina seminulum, *Linn*	..	x.	x.	..	..	..	x.	..
Rotalina Beccarii, *Linn*	..	x.	x.	..	..	..	x.	..
Spiroculina limbata	..	x.	x.	..	..	..	..	..
Spiroculina planulata, *Lamk*	..	..	x.		..	..	..	..
Triloculina Brongniartii, *D'Orb*	..	..	x.	..	..	..	..	..
Triloculina trigonula, *Lamk.*	..	x.	x.	..	..	..	..	..
Truncatulina, lobatula, *W. & J.*	..	..	x.	..	..	..	x.	..
Verneuilina polystropha ? *D'Orb*	..	..	x.	..	..	..	..	..

* As there is no evidence that any of the *Foramanifera* were taken alive on our coasts, I have been compelled to enter them in this table as dead shells. No doubt many of them lived here, but further information is required.

Issued with eighth Ann. Rept

APPENDIX III.

A LIST

OF THE

Mosses of the North-East of Ireland

BY

SAMUEL ALEX. STEWART,

Fellow of the Botanical Society of Edinburgh; Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

AND

A LIST OF

The Cretaceous Microzoa

OF THE NORTH OF IRELAND,

BY

JOSEPH WRIGHT, F.G.S., F.R.G.S.I.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

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A LIST OF

THE MOSSES OF THE NORTH-EAST OF IRELAND,

By SAMUEL ALEX. STEWART,

Fellow of the Botanical Society of Edinburgh ; Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

The district referred to here comprises the counties of Down and Antrim, with a small portion of the county of Derry adjacent, a district presenting a great variety of contour, and a very considerable range in the rocks that come to the surface. The county of Down consists mainly of Silurian slates and grits, with protruded granite that rises to a height of between 2,000 and 3,000 feet in the Mourne range. Antrim is celebrated for its great basaltic plateau, which extends also into Derry, and has an area of more than 1,000 square miles of surface. Hard Chalk usually underlies the basalt, and is in many places succeeded by thin beds of Greensand, Lias, Keuper marls, and New Red Sandstone. Metamorphic rocks, and sedimentary rocks of the Palæozoic series, also occur extensively in Antrim and Derry, while superficial deposits, consisting of clay, sand, and gravel, of Quaternary age, frequently overlie and obscure the lower beds. The coast line measures about 170 miles, a very favourable circumstance for the bryologist.

A good deal of attention has been bestowed on the Mosses of this locality since the commencement of the present century. Many of the rarer forms have been already recorded in various publications, and several detached papers referring to them have been published, the latest being a short list in the Guide to Belfast and the Adjacent Counties, issued by the Belfast Naturalists' Field Club in 1874. None of these profess, however, to be complete, and the present is the first attempt at a moss-flora of this portion of the country.

From what has been already stated, the botanist will not hesitate to conclude that the North of Ireland is rich in mosses. And so it proves: the basalt

of Antrim and Derry is peculiarly favourable to their growth. The country is well watered, and the streams, that originate in the hills, everywhere find their way to the lowlands through little glens that are deep and bushy, affording not only delightful retreats for the lover of the picturesque, but also the very best *habitats* for these tiny plants. I have yet to learn that there is any happier way of spending a summer day than searching for plants beneath the spray of little cascades; or, with the melody of running waters in our ears, climbing from crag to crag in the hope of meeting with some of the rare and beautiful forms with which nature has enriched such spots. Our winters being usually very mild, the enthusiastic collector, who is not afraid to wet his feet, can pursue his occupation during the whole year.

The elevation of the hills is considerable. In Derry and Antrim they rise to 2,000 feet, and the Mourne range of mountains is one of the most important in Ireland. The moss-flora of the district has, however, one defect, there are but few of the species that flourish on limestone to be found here. This is, no doubt, owing to the fact that the Chalk seldom appears as a surface rock, it being usually displayed in steep escarpments of the hills, and in glens where the water has cut through it. In such places it rewards us with several rare species. Of the mosses here enumerated nine are now for the first time recorded as natives of Ireland; namely, *Hypnum giganteum*, *Fissidens incurvis* (Schwaeg), *Tayloria serrata*, *Mnium subglobosum*, *Zygodon rupestris*, *Pottia littoralis*, and *Seligeria calcarea*, with *Weissia crispula* and *Hypnum resupinatum*, collected long since in the north by Dr. Moore himself, but somehow overlooked by him when preparing his synopsis of the Irish mosses. The whole number here recorded amounts to 238 species: of these I have met with 200 myself, and as I do not consider the mere recording of a plant to be entirely sufficient (no matter by whom recorded), I have deposited my specimens in the Herbarium of the Natural History Society, at the Museum, Belfast, where they are available for public criticism. It may further be added, that in making up this list all doubtful or suspicious plants have been rejected. Hasty or spurious records are held in abhorrence by all real naturalists, and rigid accuracy has been preferred to an extensive but less reliable catalogue.

It is to be regretted that the large amount of work done by the late John Templeton, the pioneer of bryology in the North of Ireland, has not been ascertained and duly credited. Owing to the absence of his collection of mosses in Turner's herbarium, and the want of precision in the early records, this cannot now be done. Much still remains to be accomplished, notwithstanding the highly creditable labours of Templeton, Dr. Moore, and others. And although there is a large number of species here recorded, our knowledge of the moss-flora of the North of Ireland is still far from perfect, and the zealous student will doubtless find many species not mentioned. This is more especially to be expected in the case of barren plants, so often passed by, and so frequently difficult of determination.

With regard to the arrangement here followed, nothing has been attempted in the way of classification. That is a work much needed, and which I hope to see performed ere long by some of our leading bryologists, armed with an authority which shall make his arrangement permanent. The sequence followed here is that of the recent Synopsis of the British Mosses, by Mr. Hobkirk, but I have thought fit to invert the order, commencing this list where it has been the more common practice to end. This seems to be justified by the method of *phanerogamic* botanists, who commence with the higher forms and end with the lower. Whether right or wrong in this plan, at any rate no inconvenience will be caused, as it is as easy to read a list backwards as forwards.

The *habitats* here assigned to the different species, and the times of fruiting, are not copied from any other work, but are deduced from my own observation, extending over a period of eleven years, during which time these particulars have been carefully noted. In all cases in which I have not sufficient information I have omitted them. The numbers appended refer to the months during which fully formed capsules may be found, and until they commence to wither.

It now only remains to express my thanks to the kind friends who have given assistance in this work. And first to Mr. Charles P. Hobkirk, of Huddersfield, who, animated by that freemasonry which pervades real naturalists, undertook for me, a total stranger, the arduous labour of microscopically examining my plants, and confirming or correcting the names I had attached to them. I owe to that gentleman's acuteness the detection amongst my specimens of two rare British mosses, not previously observed in Ireland—viz., *Pottia littoralis* and *Zygodon rupestris*, with some other rare species which I had overlooked. I am also much indebted to Dr. David Moore, F.L.S., M.R.I.A., Dublin, for directing my attention to the collection of Antrim mosses in the herbarium of Royal College of Science, Dublin, and for kindly securing me the privilege of examining the specimens and noting localities. Dr. Moore, who occupies the leading place amongst Irish bryologists, has cheerfully facilitated this work, by advice on doubtful points, and by the communication of authentic specimens. I am also under deep obligations to the Rev. John Fergusson, Forfarshire, who assisted me with specimens, and helped me over many of my early difficulties. Without such help and encouragement it is probable this work would not have been persevered with.

I have also been favoured with the assistance of Mr. J. H. Davies, of Glenmore, Lisburn, who, with the greatest liberality, placed at my disposal the whole of his very large collection of mosses, which are intended for the Museum herbarium, and which will go very far to form a complete British series. Mr. J. Creeth, of Belfast, kindly favoured me with an inspection of a good collection of mosses made by him in the vicinity of Lisburn, and which included some plants I had not myself met with.

LIST OF SPECIES.

1. FONTINALIS ANTIPYRETICA. *Linn.*

On stones in streams—not uncommon. "Attached to wood and stones in the Co. Antrim rivers."—Moore, Herb. Coll. Sc. Dublin. Woodburn, Six-mile Water, Colin Glen (Antrim); in a well near Comber, and in stream at Newtownards Glen (Down).—S.A.S. Very luxuriant specimens may be found. I have met with examples having stems two feet in length. The fruit, which is seldom abundant, is to be looked for near the base of the stem. 5-7.

2. CRYPHÆA HETEROMALLA. *Dill.*

"Abundant on trees in Glenarm Demesne, but not common in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. On an ash tree at Ballywalter (Co. Down).—S.A.S.

3. HOOKERIA LUCENS. *Dill.*

Damp, wooded banks of streams in hilly districts. This beautiful moss is widely distributed, but rarely abundant. "On moist shady banks in northern glens"—Moore, Herb. Coll. Sc. Dublin. Glenoe, Woodburn (Antrim); Cregagh Glen, Dundonald, Holywood Wood, Drumbo Glen (Down).—S.A.S. 12-1.

Neckera pennata is stated to have been found on trees in Colin Glen, near Belfast, but I believe there has been an error regarding this: it is certainly not there now.

4. NECKERA CRISPA. *Dill.*

Frequent on rocks in mountainous localities. "In fruit at the head of Glenariff, July, 1836."—Moore, Herb. Coll. Sc. Dublin. Glenarm, Sallagh Braes, Black Mountain, and Colin Glen (Antrim); Newtownards Glen, Slieve Donard (Down).—S.A.S.

5. N. COMPLANATA. *Linn.*

Trunks of trees, and rocks—not rare. "Frequent on trunks of trees through the Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Redhall, Knockagh, Colin Glen (Antrim); Glenmachan, Mealough Hill (Down).—S.A.S. 12-3.

6. OMALIA TRICHOMANOIDES. *Dill.*

Hedge banks, rocks, and trees—common. Moneymore (Derry); Knockagh, Carnmoney Hill, Belfast Hills (Antrim); Castlereagh and Holywood Hills, Drumbo Glen (Down).—S.A.S. 10-2.

7. HYPNUM LOREUM. *Dill.*

Mainly on mountain heaths and bogs—not common. "Glenariff, and frequent on shady banks and under trees in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Plentiful on peat bog on summit of Slieve Gallion (Derry); ditch bank at Whitewell quarries, Cave Hill (Antrim); barren.—S.A.S. It fruits in the greatest profusion in a wood at Pomeroy, Co. Tyrone. I have found large specimens of *H. striatum* doing duty for this species in collections.

8. H. TRIQUETRUM. *Dill.*

Abundant in woods, and on shady banks throughout the district. 11-3.

9. H. SQUARROSUM. *Dill.*

Grassy fields, hedge banks, and heaths—everywhere abundant. Fruit seldom found, but occasionally abundant. 11-3.

10. H. BREVIROSTRE. *Ehr.*

Woods and glens in mountainous districts—frequent, but usually not abundant. "Glenariff, Glenarm, and Colin Glen."—Moore, Herb. Coll. Sc. Dublin. Carndaisy Glen near Moneymore (Derry); Woodburn Glens, Glynn, Carr's Glen near Belfast (Antrim); Newtownards Glen, Glenmachan, Slieve Croob (Down).—S.A.S. I have not found it in fruit.

11. H. SPLENDENS. *Dill.*

Abundant on heaths and damp banks—fruit rare. On hills of Derry, Antrim, and Down: at 2,200 feet on Slieve Donard (Down).—S.A.S. 3-5.

12. H. SCORPIODES. *Dill.*

"Bogs in the north, frequent but not in fruit."—Moore, Herb. Coll. Sc. Dublin. Boggy heath on Slieve Croob (Down).—S.A.S.

13. H. STRAMINEUM. *Dicks.*

"Of frequent occurrence—rare in fruit. Glenmakerron, June, 1836."—Moore, Herb. Coll. Sc. Dublin.

14. H. PURUM. *Dill.*

Shady glens, ditch banks, and mossy places in damp stony ground—fruit scarce. Common from Slieve Gallion (Derry), to Slieve Donard (Down). 10-12.

15. HYPNUM SCHREBERI. *Dill.*

Mountain moors and heathy wastes—frequent, but always barren.

16. H. CUSPIDATUM. *Dill.*

Marshy grounds throughout the district—abundant at both high and low elevations. 4-5.

17. H. CORDIFOLIUM. *Hedw.*

Bogs and marshes—not common. "On bogs, amongst *Sphagnum*, at Ballycastle."—Moore, Herb. Coll. Sc. Dublin. Boggy heath on Carrickfergus Commons (Antrim); peaty marsh near Moneyreagh (Down).—S.A.S.

18. H. GIGANTEUM. *Schimper.*

Boggy and stony heath—very rare. Carrickfergus Commons (Antrim); Slieve Croob (Down).—S.A.S. Not found elsewhere in Ireland.

19. H. PALUSTRE. *Linn.*

On stones in streams—common. 5-6.

VAR. B. SUBSPHŒROCARPON. *De Notr.* "On stones in streamlets flowing from the hills between Cushendall and Ballymena; near Carrickfergus."—Moore, Proc. R. I. Acad., Series II., Vol I., No. 8. I find in some cases the long nerve of this var., but can see no other difference.—S.A.S.

20. H. MOLLUSCUM. *Hedw.*

Abundant on rocks of various mineralogical characters through Derry, Antrim, and Down. Fruit usually scarce. 1-4.

21. H. RESUPINATUM. *Wils.*

Rare. "On trees, Glendun."—Moore, Herb. Coll. Sc. Dublin. On loose limestone blocks, Knockagh (Antrim).—S.A.S.

22. H. CUPRESSIFORME. *Dill.*

On stones, trees, and mossy banks. In profusion everywhere throughout Derry, Antrim, and Down—varies exceedingly. 11-2.

23. H. HAMULOSUM. *Frolich.*

Very rare. On chalk rocks. Crow Glen and Black Mountain, Belfast; barren.—S.A.S.

24. H. FILICINUM. *Dill.*

Marshes in glens and upland districts—frequent, but seldom fruiting. "Near head of Glenariff, but rare."—Moore, Herb. Coll. Sc. Dublin. Slieve

Gallion and Carndaisy (Derry); Agnew's Hill, Woodburn, Belfast Hills (Antrim); Holywood Hill (Down).—S.A.S. 2-5.

25. HYPNUM COMMUTATUM. *Dill.*

Bogs, marshes, and wet rocks. Abundant from Slieve Gallion to Slieve Donard. 4-5. Some of my specimens have been named as the var. *condensatum*, = *H. falcatum*—Bridel, but I am not able to distinguish the forms sufficiently.

26. H. UNCINATUM. *Hedw.*

Wet rocks, and damp stony ground in hilly districts—not infrequent. Slieve Gallion (Derry); Woodburn, Black Mountain, Colin Glen (Antrim); lower slopes of Slieve Donard (Down).—S.A.S. 4-6.

27. H. REVOLVENS. *Swartz.*

Peaty and marshy places—rather rare. Wet stony heath, Carrickfergus Commons; peaty marsh, Cave Hill; Slemish Mountain (Antrim); Slieve Croob (Down).—S.A.S. 5-6.

28. H. LYCOPODIODES. *Neck.*

"Fruiting in a bog, parish of Rasharkin, Co. Antrim, 1835."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

29. H. ADUNCUM. *Linn.* H. exannulatum. *Gumb.*

Boggy heaths—rare. "Bogs near Ballycastle, and other places in the Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Boggy banks of stream on Black Mountain, near Belfast.—S.A.S.

30. H. STELLATUM. *Dill.*

"On bogs in the moors above Carnlough (Antrim); barren."—Moore, Herb. Coll. Sc. Dublin.

31. H. IRRIGUUM. *Wils.*

Rare. On stones in stream at Magheramorne (Antrim).—S.A.S.

32. H. SERPENS. *Dill.*

On trees, stones, and hedge banks—frequent. "Abundant everywhere through Ireland."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Moneymore, Toome (Derry); shores of Lough Neagh, Kilroot, Knockagh, &c. (Antrim); Sydenham, Castlereagh Hills (Down).—S.A.S. 2-5.

33. HYPNUM UNDULATUM. *Dill.*

On mountain heaths—not infrequent. "On moist banks in the northern glens—frequent."—Moore, Herb. Coll. Sc. Dublin. Slieve Gallion, and Sperrin Mountains (Derry); Agnew's Hill (Antrim); Slieve Donard (Down), at 1,800 feet.—S.A.S. An elegant moss that only occurs in small quantity. I have not met with it in fruit.

34. H. SYLVATICUM. *Dill.*

Rocks and banks—rare. Near Lisburn—Mr. J. Creeth. Crevices of basaltic rocks, Knockagh; in fruit on Black Mountain, 4th July, 1864 (Antrim); ditch bank, Castlereagh Hill (Down).—S.A.S.

35. H. ELEGANS. *Hook.*

Very rare. Among loose stones, Slieve Donard (Down); barren.—S.A.S.

36. H. DENTICULATUM. *Dill.*

Not common. "Frequent in shady crevices of rocks, as at Ballygally Head."—Moore, Herb. Coll. Sc. Dublin. On rocks at Slemish Mountain (Antrim).—S.A.S.

37. H. PULCHELLUM. *Dicks.*

"Abundant in shady crevices of rocks at Sallagh Braes and Agnew's Hill." —Moore, Herb. Coll. Sc. Dublin.

38. H. ALOPECURUM. *Dill.* (Thamnium.)

Damp woods and shady banks of streams—abundant and luxuriant. Derry, Antrim, Down. 10-2.

39. H. RUSCIFOLIUM. *Dill.*

On stones in streams, throughout Derry, Antrim, Down. 9-2.

40. H. MURALE. *Dill.*

"Tops of walls, and on stones near Ballycastle."—Moore, Herb. Coll. Sc. Dublin.

41. H. CONFERTUM. *Dicks.*

On damp shady banks, on stones, and on trees, occasionally on walls—common. 11-2.

42. H. TEESDALII. *Sm.*

Very rare. Found in 1859 by Mr. J. H. Davies, in Colin Glen, near Belfast. This, which is amongst the rarest Irish mosses, occurs on wet rocks

by the side of the stream in the upper glen : I find it also on wet rocks in Redhall Glen, near Ballycarry (Antrim).—S.A.S. 4-6.

43. HYPNUM TENELLUM. *Dicks.*

On limestone and basaltic rocks—not common. "Abundant on shady rocks and stones."—Moore, Herb. Coll. Sc. Dublin. In crevices of wet basaltic rocks, Sallagh Braes ; on chalk rocks, Redhall Glen, Carr's Glen, Cave Hill (Antrim).—S.A.S. 1-4.

44. H. SWARTZII. *Turner.*

There is a specimen in Dr. Moore's Antrim Mosses in the Herb. Coll. Sc., but no locality is given. Woodburn Glen, Colin Glen (Antrim).—S.A.S.

H. flagellare should be found, it occurs at Pomeroy, in the neighbouring county of Tyrone.

45. H. PUMILUM. *Wils.*

"Antrim, Templeton in Herb. Turner."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

46. H. PRŒLONGUM. *Dill.*

On stones and banks, and at roots of trees in damp shady places—common in Derry, Antrim, and Down. 10-2.

H. Stokesii, Turner, *which is now considered as only a form of the preceding, occurs in woods in several localities.*

47. H. PILIFERUM. *Vaill.*

Damp rocky banks in glens—frequent. "Occurs with fruit near Belfast." —Templeton, Flora Hibernica. Glynn near Larne, Glenoe, Woodburn, Carr's Glen near Belfast (Antrim) ; Banbridge, Newtownards Glen (Down).—S.A.S. Fruit very rare.

48. H. MYOSUROIDES. *Linn.*

At roots of trees, and on stones in damp places—not rare. "Frequent in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Carndaisy Glen (Derry) ; Kilwaughter, Woodburn, Knockagh (Antrim) ; Portavo Wood (Down).—S.A.S. 11-2.

49. H. STRIATUM. *Hedw.*

Woods, shady banks, and sometimes on trees—common. "Shady banks and woods through the Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Moneymore (Derry) ; Glynn, Woodburn, Colin Glen, Derriaghy (Antrim) ; Ballylesson, Banbridge, Ballynahinch (Down).—S.A.S. 11-2.

50. HYPNUM PLUMOSUM. *Swartz.*

Frequent on wet rocks, and on stones in mountain streams. "On moist stones and banks in Co. Antrim—not rare."—Moore, Herb. Coll. Sc. Dublin. Moneymore (Derry); Agnew's Hill, Woodburn, Belfast Hills, Colin Glen (Antrim); Ballyoran, Slieve Croob (Down).—S.A.S. 10-2.

51. H. POPULEUM. *Hedw.*

Frequent on stones, more rarely on trees. Sallagh Braes near Larne, Kilroot, Woodburn, Knockagh, Carnmoney Hill, Belfast Hills (Antrim); hills near Holywood and Newtownards (Down).—S.A.S. 11-2.

52. H. RUTABULUM. *Linn.*

Damp banks, on stones, on the ground, and sometimes on walls and trees—abundant everywhere. 10-3.

53. H. VELUTINUM. *Linn.*

On stones, hedge banks, walls, and sometimes on trees—common in Derry, Antrim, and Down. 11-2.

54. H. ALBICANS. *Dill.*

"Glenarm, and through the county of Antrim."—Moore, Herb. Coll. Sc. Dublin. This moss occurs on sandy shores all round the Down coast, but always barren.—S.A.S.

55. H. GLAREOSUM. *Bruch.*

"On a moist meadow in Glenaan, Co. Antrim, but rare."—Moore, Herb. Coll. Sc. Dublin. On ditch bank west of Carrick Junction Station (Antrim); barren.—S.A.S. Probably not rare, but easily overlooked.

56. H. LUTESCENS. *Dill.*

Rare. "Moist boggy places in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. In old chalk quarry at Springhill, Moneymore (Derry); in fruit Dec. 26, 1872.—S.A.S.

57. H. TAMARISCINUM. *Hedw.*

In shady glens, and on damp banks in woods and hedges—very common. 11-12.

58. LESKEA SERICEA. *Dill.*

On rocks, stones, trees, walls, and dry banks—frequent through Derry, Antrim, and Down. 11-2.

59. CLIMACIUM DENDROIDES. *Web. and Mohr.*

Wet mountain pastures, marshy meadows, and lake shores—frequent in Derry, Antrim, and Down. A species easily recognised, but I have not found it in fruit.

60. ISOTHECIUM MYURUM. *Dill.*

On rocks, stones, trees, and banks in woods and glens—common in Derry, Antrim, and Down. 11-1.

61. PTEROGONIUM GRACILE. *Swartz.*

Rare. In some quantity on trap rocks near summit of Ballygally Head (Antrim).—S.A.S.

62. P. FILIFORME. *Hedw.*

"On rocks near Ballygally Head, and other places in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin.

63. ANOMODON VITICULOSUS. *Hook. and Tayl.*

On chalk and basalt rocks—not uncommon. "Frequent on limestone rocks; in fruit at Ballygally Head, Feb., 1837."—Moore, Herb. Coll. Sc. Dublin. Abundant in several localities in Co. Antrim, but I have not found it in fruit.—S. A. S.

64. ANTITRICHIA CURTIPENDULA. *Bridel.*

Rare. "Summit of Colin Mountain, Belfast range."—Mr. J. H. Davies, Phytologist, New Series, Vol. III.

65. ANÆCTANGIUM COMPACTUM. *Schwaeg.*

"Frequent in northern glens, Carnlough, June, 1838."—Moore, Herb. Coll. Sc. Dublin.

66. FISSIDENS TAXIFOLIUS. *Hedw.*

Wet banks in woods and glens, and crevices of rocks—frequent. Larne, Belfast Hills (Antrim); Holywood Hills, Slieve Croob (Down).—S.A.S. 11-2.

67. F. ADIANTOIDES. *Hedw.*

Damp shady rocks, wet heaths and banks, sometimes in bogs—rather frequent. "Glenariff, Cushendall, &c."—Moore, Herb. Coll. Sc. Dublin. Moneymore (Derry); Sallagh Braes, Agnew's Hill, Kilwaughter, Belfast Hills, Colin Glen (Antrim); Cregagh Glen, Drumbo Glen (Down).—S.A.S. Fruit scarce. 12-4.

68. FISSIDENS BRYOIDES. *Hedw.*

Sides of streams, and shady hedge banks—very common. 11-3.

69. F. INCURVIS. *Schwaeg. non Br. and Schimp.*

Very rare. In some plenty on a fallen mass of greensand rock on Black Mountain, near Whiterock, west of Belfast. On damp chalk rocks in Redhall Glen, near Ballycarry (Antrim).—S.A.S. The specimens are in good fruit, and this very minute moss may possibly prove to be the *F. pusillus*, Wils., of which I have not seen any specimens. Not found elsewhere in Ireland.

70. TAYLORIA SERRATA. *Br. and Schimp.*

Very rare. On the 13th July, 1868, I met with one patch of this rare and interesting moss growing on cow-dung in boggy ground near the summit of Benbradagh Mountain, above Dungiven, Co. Derry. The moss was at that time only commencing to fruit, but one stem having a mature capsule. The only Irish station.

71. TETRAPLODON MNIOIDES. *Br. and Schimp.*

Marshy ground on mountains—rare. On the summits of Slieve Donard and Slieve Bingian in the Mourne range (Down).—S.A.S. 6-7.

72. SPLACHNUM SPHŒRICUM. *Hedw.*

On decomposing cow-dung on mountain bogs—not rare. Benbradagh (Derry); wet heath above Carnlough, Cave Hill, Black Mountain (Antrim); abundant on Slieve Croob (Down).—S.A.S. 6-7.

73. S. AMPULLACEUM. *Linn.*

Occupies similar habitats, but is less frequent than No. 72. "Rasharkin and Glenravel."—Moore, Herb. Coll. Sc. Dublin. Knockagh and Cave Hill (Antrim).—S.A.S. 5-6.

74. BARTRAMIA ITHYPHYLLA. *Bridel.*

Dry rocks—rare. "Rocks above Carrickfergus."—Moore, Herb. Coll. Sc. Dublin. Basaltic cliffs, Knockagh; on basalt, Black Mountain (Antrim). —S.A.S.

75. B. ŒDERI. *Gunner.*

Rare. "Deer Park, Glenarm; Colin Glen."—Moore, Herb. Coll. Sc. Dublin.

76. B. HALLERIANA. *Hedw.*

Rare. "At Colin Glen, near Belfast."—Flor. Hib. "At Colin Glen, near the top."—Moore, Herb. Coll. Sc. Dublin.

77. BARTRAMIA POMIFORMIS. *Hedw.*

Sandy banks and dry rocks—not rare. "Frequent in the glens of Antrim." —Moore, Herb. Coll. Sc. Dublin. Slemish Mountain, Woodburn Glen (Antrim); Ballylesson, abundant and fine in Drumbo Glen, in crevices of granite rocks on Slieve Donard (Down).—S.A.S. 4-5.

78. B. CALCAREA. *Br. and Schimp.*

Not common. Damp places, Belfast Hills (Antrim); marshy margin of stream at upper end of Holywood Glen (Down).—S.A.S. 7-8.

79. B. FONTANA. *Bridel.*

Wet places in hilly districts—common from the Sperrin range in Tyrone and Derry, to the Mourne Mountains in Down. 6-7.

80. B. ARCUATA. *Bridel.*

Common among heath on mountains and hills through Derry, Antrim, and Down; found in fruit by Dr. Moore near Carrickfergus. I have not met with it in that state.

81. PHYSCOMITRIUM PYRIFORME. *Br. and Schimp.*

Marshy ground, and furrows of sandy and gravelly fields—not uncommon. "Glenariff."—Moore, Herb. Coll. Sc. Dublin. The Plains, and Ormeau Park, Belfast; Kilroot, Loughmourne, Black Mountain, Lisburn (Antrim); Portavo, Dromore (Down).—S.A.S. 4-6.

82. P. FASCICULARE. *Br. and Schimp.*

Damp pasture fields on clay and gravel—scarce. "Giant's Causeway, The Glens, and near Belfast."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Whitehead, Kilroot (Antrim); Ballymachan, Sydenham (Down).—S.A.S. 4-6.

83. ENTOSTHODON TEMPLETONI. *Schwaeg.*

"Abundant by the sides of rivers in northern glens."—Moore, Herb. Coll. Sc. Dublin. Not common in the southern part of the Co. Antrim; I have not yet met with it.—S.A.S.

84. FUNARIA HYGROMETRICA. *Hedw.*

On walls, waste ground, and dry heaths. This cosmopolitan moss is in profusion everywhere throughout the district. 2-7.

VAR. B. PATULA. On wall, Castlereagh Hill (Down).—S.A.S.

85. FUNARIA MUHLENBERGII. *Schwaeg.*

"On limestone soil, Deer Park, Cave Hill, Belfast."—Moore, Herb. Coll. Sc. Dublin.

86. AMBLYODON DEALBATUS. *Beauv.*

"Mountains in the North of Ireland."—Templeton, Flor. Hib. "On a flow-bog in the parish of Rasharkin, 1837."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

87. MNIUM SUBGLOBOSUM. *Br. and Schimp.*

Wet peat bogs—rare. Carrickfergus Commons, and margin of Lough Mourne in the same locality, Cave Hill (Antrim).—S.A.S. 2-4. Not known elsewhere in Ireland. This moss must be sought, at the expense of damp feet, in the wettest parts of the bog, where it fruits, but not abundantly, under tufts of sedge and coarse grass.

88. M. PUNCTATUM. *Hedw.*

River banks, and wet rocks in mountainous districts—frequent. Slemish, Sallagh Braes, Belfast Hills (Antrim); Mourne Mountains (Down).—S.A.S. Very luxuriant specimens are found. 11-5.

89. M. UNDULATUM. *Hedw.*

Shady banks near streams, and in glens—frequent from Slieve Gallion to Slieve Donard, but not usually abundant. The only occasion on which I found this moss in fruit was in Feb., 1866.

90. M. HORNUM. *Linn.*

On shady hedge-banks, and in woods—common, and very large. 3-5.

91. M. ROSTRATUM. *Schwaeg.*

On wet rocks and stones near streams—not common. Colin Glen, and other glens in the Belfast Hills.—S.A.S. An elegant moss, and fruiting abundantly. 3-5.

92. BRYUM ROSEUM. *Schreb.*

Very rare. "On dry rocks in the Little Deer Park, Glenarm; barren. —Moore, Herb. Coll. Sc. Dublin.

93. B. ZIERII. *Dicks.*

Mountains—very rare. "Clontygearagh, near Cushendun, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Very sparingly on basaltic cliffs at Sallagh Braes, near Larne (Antrim).—S.A.S. My specimens are barren.

94. BRYUM ARGENTEUM. *Linn.*

On walls, roofs of houses, roadsides, and waste ground—very common, and may be found in fruit nearly the whole year round.

VAR. C. LANATUM.

This form seems to prevail here. I have specimens from several localities that answer the description.

95. B. JULACEUM. *Sm.*

"Abundant in Glendun; in fruit July, 1836."—Moore, Herb. Coll. Sc. Dublin.

96. B. ERYTHROCARPON. *Bridel. non Schwaeg.* B. atropurpureum. *Web. and Mohr.*

On walls, waste ground, and quarry heaps—frequent. Cave Hill Quarries, and several places near Belfast, and Lisburn (Antrim); Newtownards, Millisle, Dundrum (Down).—S.A.S. 4-7.

97. B. SANGUINEUM. *Ludw.* B. erythrocarpon. *Schwaeg.*

Walls—not common. Very fine and abundant on old wall between Donaghadee and Millisle (Down).—S.A.S. In fruit 25th April, 1874.

98. B. CÆSPITICIUM. *Linn.*

Belfast Hills, and common in many places, but not nearly so abundant as its near ally No. 99.

99. B. CAPILLARE. *Hedw.*

On walls, trees, rocks, and dry banks—very common. 1-6.

100. B. INTERMEDIUM. *Bridel.*

Gravelly shores of Lough Neagh (Antrim); and gravel bank at Ballymachan (Down); near Belfast.

101. B. INCLINATUM. *Br. and Schimp.*

People's Park, Belfast.

102. B. CERNUUM. *Hedw.*

On walls—not uncommon. Toome (Derry); near Lisburn (Antrim). The distribution of this, and the two preceding species, is imperfectly known.

103. BRYUM PALLENS. *Swartz.*

Banks of streams, and in boggy places—not common. "Banks of stream above Colin Glen."—Mr. J. H. Davies, Phytologist, Vol. III. Sluggada Burn at Dart Mountain (Derry); not rare in the same range, rising to 1,400 feet. Wet bog at Duneane, near Randalstown (Antrim).—S.A.S. 6-7.

104. B. ALPINUM. *Linn.*

Mountain heaths—frequent. Slieve Gallion (Derry); Slemish, Agnew's Hill, Divis Mountain (Antrim); descending to near the sea level on Slieve Donard (Down).—S.A.S. All barren. Dr. Moore found it in fruit on Carrickfergus Commons in June, 1836.

105. B. PSEUDO-TRIQUETRUM. *Schwaeg.*

Wet rocky places, and banks of streams in the hills—rare. On Slemish Mountain, and on wet basaltic rocks in Colin Glen (Antrim); on slate rocks in Newtownards Glen, old quarry at Ballymachan, wet rocks on Slieve Donard (Down).—S.A.S. 5-7.

106. B. WAHLENBERGII. *Schwaeg.*

Dripping rocks and wet stony places—not common. "The Glens near Cushendall."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Prospect Hill, Lisburn.—Mr. J. Creeth. Crow Glen near Belfast (Antrim); Ballymachan, Banbridge (Down).—S.A.S. 4-5.

107. B. CARNEUM. *Linn.*

Sides of drains and streams, and on rocky river banks—not rare. "Banks of small rivulet at Ballintoy."—Moore, Herb. Coll. Sc. Dublin. Woodburn, Belfast Hills, Lisburn (Antrim); Ballymachan Glen (Down).—S.A.S. 3-5.

108. B. NUTANS. *Schreb.*

Bogs and wet heaths—frequent. "Slemish."—Moore, Herb. Coll. Sc. Dublin. Woodburn, Belfast Hills, Lisburn (Antrim); rising to 1,600 feet on Slieve Croob, and to over 2,000 on Slieve Donard (Down).—S.A.S. 4-5.

109. B. CRUDUM. *Schreb.*

"On a flow bog, in the parish of Rasharkin, Antrim, 1837."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Carnlough Glen near the Waterfall."—Moore, Herb. Coll. Sc. Dublin.

110. AULACOMNION PALUSTRE. *Schwaeg.*

Marshy heaths and wet peat bogs—frequent. Slieve Gallion (Derry);

shores of Lough Neagh, Duneane near Randalstown, Slemish, Tardree, Sallagh Braes, Carrickfergus Commons, King's Moss, Belfast Hills (Antrim); Moneyreagh, Conlig, Slieve Croob (Down).—S.A.S. 5-6.

111. POLITRICHUM PILIFERUM. *Schreb.*

Dry turfy banks—common from the Derry and Tyrone Mountains to the Mourne range in Down; rising to 2,000 feet. 4-6.

112. P. JUNIPERINUM. *Hedw.*

"Frequent on banks in northern glens."—Moore, Herb. Coll. Sc. Dublin. Near Lisburn (Antrim).—Mr. J. Creeth. Ballygally Head (Antrim); near Banbridge (Down).—S.A.S.

113. P. COMMUNE. *Linn.*

On heaths and bogs—common everywhere. Rising to summit of Slieve Donard (Down) 2,796 feet. 4-6.

114. P. GRACILE. *Menzies.*

"Turf bogs—common in Ireland."—Moore, Proc. R. I. Acad., Series II., Vol I., No. 8. Tardree (Antrim); Conlig (Down).—S.A.S. I have also met with this moss at Tartaraghan, Co. Armagh; probably passed by as a small form of *P. commune*, which it resembles.

115. POGANATUM ALPINUM. *Bridel.*

Heaths and bogs—frequent. "Slemish."—Moore, Herb. Coll. Sc. Dublin. Abundant on the Sperrin Mountains in Derry and Tyrone; bogs at Toome (Derry); Knockagh, Belfast Hills (Antrim). 5-7.

116. P. URNIGERUM. *Bridel.*

Heaths, and sandy and gravelly banks—frequent. "Banks in Glendun, and other places in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Near Lisburn.—Mr. J. Creeth. Knocklayd, Whitehead, Belfast Hills (Antrim); Castlereagh Hill, Slieve Croob, Slieve Donard (Down).—S.A.S. 12-2.

117. P. ALOIDES. *Bridel.*

Dry shady banks, especially in heathy places—common in Derry, Antrim, and Down. 10-3.

118. P. NANUM. *Bridel, non Weiss.*

Sandy and gravelly banks, and dry heaths—frequent. Old quarry, Castledawson (Derry); Sallagh Braes, Slieve True, Black Mountain, Derriaghy,

Newforge (Antrim); Sydenham, Castlereagh Hill, Slieve Donard, Banbridge (Down).—S.A.S. The variety *longisetum* occurs in the People's Park, Belfast; it prevails most, however, on mountain heaths—the typical form on sandy banks. Small forms of the preceding are sometimes taken for this species.

119. AVTRICHUM UNDULATUM. *Beaur.*

Woods and shady banks—common everywhere. 11-2.

120. TETRADONTIUM BROWNIANUM. *Schwaeg.*

"In a glen near Ballycastle; in fine fruit July, 1835."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Glenmakerron, Ballyvally, June, 1836." —Moore, Herb. Coll. Sc. Dublin.

121. TETRAPHIS PELLUCIDA. *Hedw.*

Very rare. "Glenariff, Co. Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

122. ZYGODON CONOIDEUS. *Dicks.*

"On trees, Orange Grove, near Belfast, Templeton."—Flor. Hib. "Rare, only observed on trees in Glenarm Deer Park."—Moore, Herb. Coll. Sc. Dublin.

123. Z. RUPESTRIS. *Schimp.* Z. Stirtoni. *Schimp, MS.* = Z. viridissimus, Var. B. rupestris.

Very rare. This interesting addition to the Irish moss-flora was found by me on basaltic rocks, by the stream in the little glen at Glenoe, between Carrickfergus and Larne. The tuft was in good fruit in Feb., 1875. I also found it in the barren state in crevices of rocks on the shore at Portavo, Co. Down. I am indebted to Mr. Hobkirk, who pointed out to me that my moss was not *Z. viridissimus*, as I then thought.

124. Z. MOUGEOTTII. *Br. and Schimp.*

Rare. "A solitary stem with fruit was found near the head of Glenballyeman, Cushendall, in June, 1863."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Colin Glen."—Mr. J. H. Davies, Phyto., N.S., Vol. III.

125. ORTHOTRICHUM PHYLLANTHUM. *Br. and Schimp.*

On trees, and occasionally on stones and rocks—very common, but always barren.

126. ORTHOTRICHUM DRUMMONDII. *Hook. and Grev.*

On trees—very rare. In Dec., 1869, I found in Colin Glen, near Belfast, one small tuft that seems without doubt to belong to this species, though the capsules were far advanced.

127. O. BRUCHII. *Bridel.*

On trees—not common. "Colin Glen, sparingly."—Mr. J. H. Davies, Phytologist, N. S., Vol. III. Near Ballycastle, on bushes plentifully in little glen near Glenoe (Antrim).—S.A.S.

128. O. CRISPUM. *Hedw.*

Abundant on trees and bushes throughout the district. 6-11.

129. O. SAXATILE. *Bridel.* O. anomalum. *Bryol. Brit.*

On limestone, basalt, and other rocks—frequent, and usually in abundance. "Frequent on white limestone rocks in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Sperrin Mountains (Derry); Larne, Carrickfergus Commons, Belfast Hills (Antrim).—S.A.S. 3-5.

130. O. PULCHELLUM. *Sm.*

On trees and bushes—frequent, but not abundant. More commonly found in little tufts on branches of bushes that overhang streams. "On trees, Glenarm, and other places in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Near Lisburn.—Mr. J. Creeth. On beech trees growing on rath at Rookstown between Moneymore and Slieve Gallion (Derry); on blackthorn at Glenoe, on hazel bushes Cave Hill and Colin Glen (Antrim); on branches of Guelder rose Dundonald Glen (Down).—S.A.S. 2-5.

131. O. LEIOCARPUM. *Br. and Schimp.*

On trees—not common. "Glenarm Demesne, and near Ballycastle."—Moore, Herb. Coll. Sc. Dublin. On beech trees in planting at Drumcormick at foot of Slieve Gallion above Moneymore (Derry); Redhall Glen and Cave Hill (Antrim); Belvoir Park (Down).—S.A.S. 3-5.

132. O. DIAPHANUM. *Schrad.*

On trees, and on stones—common. Blackhead, Kilroot, Whitehouse, Colin Glen (Antrim); Moira, Drumbo Glen, Newtownbreda (Down).—S.A.S. 1-5.

133. O. LYELLII. *Hook. and Tayl.*

On trees—not common. Glenarm Park; near the Lagan at Shaw's Bridge (Antrim); Belvoir Park and Banbridge (Down); all barren.—S.A.S.

134. ORTHOTRICHUM RUPESTRE. *Schleich.*

Rare. "On basaltic rocks near the Giant's Causeway, 1837; Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

135. O. AFFINE. *Schrad.*

On trees, and sometimes on stones—very common throughout the district. 3-6.

136. O. STURMII. *Hop. and Hornsch.*

Rare. "Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

137. O. CUPULATUM. *Hoffm.*

On rocks, but more often on stones in streams—not rare, abundant where it occurs. "On rocks at Fairhead."—Moore, Herb. Coll. Sc. Dublin. Glynn near Larne, Kilroot, Glenoe, North Woodburn stream, in a little stream near Trench House The Falls (Antrim).—S.A.S. 1-5. A fine moss, with glabrous inflated veil, and large nearly globular sporangium: all the specimens I have met with belong to the var. *nudum*, and are very different in aspect from what we expect from descriptions of this species.

138. PTYCHOMITRIUM POLYPHYLLUM. *Br. and Schimp.*

On rocks and stones in hilly districts, and sometimes on bushes—very abundant from the Derry mountains to the Mourne range. 11-4.

139. GLYPHOMITRIUM DAVIESII. *Schwaeg.*

On basaltic and granitic rocks—rare. "On rocks at Fairhead."—Flor. Hib. "On the basalt at Giant's Causeway, also at Fairhead and Rathlin Island, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Abundant at the "Grayman's Path" Fairhead; on trap rocks, Ballygalley Head (Antrim); on granite rocks, Slieve Donard (Down).—S.A.S.

140. RACOMITRIUM CANESCENS. *Bridel.*

Stony heaths, and sandhills—not uncommon. "Frequent on rocks through Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Carrickfergus Commons, Woodburn, Belfast Hills (Antrim); stony heath, Newtownards; sandhills, Newcastle (Down).—S.A.S. 1-3.

141. R. LANUGINOSUM. *Bridel.*

Mountain heaths—common in Antrim, Derry, and Down. At 1,700 feet on Slieve Croob, and over 2,500 on Slieve Donard (Down). 11-4.

142. RACOMITRIUM HETEROSTICHUM. *Bridel.*

Rocks and stones on the hills—very common, from the mountains of Derry to those of Down. 11-3.

143. R. FASCICULARE. *Bridel.*

On rocks and stones in mountainous districts—common from Slieve Gallion (Derry), to Slieve Donard (Down). 11-3.

144 R. SUDETICUM. *Br. and Schimp.*

Rocks on mountains—rare. "Sparingly on Slemish."—Moore, Herb. Coll. Sc. Dublin. Abundant on granite rocks Slieve Donard, from 1,000 feet to the summit, on the carn at the top of Slieve Croob (Down).—S.A.S. 3-4.

145. R. ACICULARE. *Bridel.*

On wet rocks, and on stones in streams in hilly regions—common in Derry, Antrim, and Down. 11-4.

146. R. ELLIPTICUM. *Br. and Schimp.*

On rocks—rare. "On rocks at Fairhead."—Flor. Hib. "Abundant on Fairhead and Slemish."—Moore, Herb. Coll. Sc. Dublin. Meenard Mountain (Derry).—S.A.S. I find this species still intermixed at Fairhead with *G. Daviesii*, as mentioned by Dr. Taylor in Flor. Hib. On Slemish it is in considerable abundance.

147. R. PATENS. *Bridel.*

Very rare. "In large tufts on Slemish Mountain; barren."—Moore, Herb. Coll. Sc. Dublin. I have seen it on Slemish, but not in fruit.—S.A.S.

148. GRIMMIA LEUCOPHEA. *Grev.*

Rare. "On trap rocks near the Giant's Causeway, Antrim; also, on a similar rock in the island of Rathlin, 1837."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

149. G. OVATA. *Web. and Mohr.*

Mountain rocks—very rare. In October, 1873, I found a few little tufts of this moss in fruit, on stones at the summit of Sallagh Braes, near Larne (Antrim); this is the only known instance of its occurrence in the North of Ireland.

150. GRIMMIA TRICHOPHYLLA. *Grev.*

Very rare. "On rocks at Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

151. G. FUNALIS. *Schwaeg.* G. spiralis. *Hook. and Tayl.*

On mountains—not uncommon. "Slemish, and Agnew's Hill."—Moore, Herb. Coll. Sc. Dublin. On trap rocks, Benbradagh (Derry); Slemish, Sallagh Braes (Antrim); on granite rocks, Slieve Donard (Down).—S.A.S. Abundant in all these places, but barren.

152. G. ROBUSTA. *Fergusson.*

Very rare. "Fairhead, Antrim, 1862."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

153. G. SCHULTZII. *Bridel.*

Mountain rocks—rare. "On the top of Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. In some plenty on detached blocks of granite, Slieve Donard (Down).—S.A.S. 3-4.

154. G. PULVINATA. *Sm.*

On rocks, walls, and stone dykes—very common at sea level, and on mountains. 11-4.

VAR. B. OBTUSA. With shorter capsules, and short blunt lid, is plentiful on basaltic cliffs at the Knockagh near Carrickfergus (Antrim).

155. G. MARITIMA. *Br. and Schimp.*

Abundant on maritime rocks all round our coast. 11-3.

156. G. APOCARPA. *Br. and Schimp.*

On rocks and stones in damp places; abundant and generally distributed in Derry, Antrim, and Down. 11-3.

VAR. C. RIVULARE. Frequent on stones in streams.

157. G. CONFERTA. *Br. and Schimp.*

On amygdaloidal trap—not rare near Belfast. "On rotten trap rocks near Belfast."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Cave Hill, Knockagh, &c. (Antrim).—S.A.S. Our plant, which is the var. *incana*, approaches the preceding in characters; all the leaves are piliferous, with long hair points, giving the tufts a hoary aspect.

158. HEDWIGIUM IMBERBE. *Br. and Schimp.*

"Fairhead, Antrim, very fine, May, 1854."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. On trap rocks near summit of Ballygally Head (Antrim). - S.A.S.

159. HEDWIGIA CILIATA. *Hedw.*

Rocks and stones; abundant on the hills from Slieve Gallion (Derry) to the Mourne Mountains (Down); ascending to 1,600 feet. 3-5.

160. ENCALYPTA STREPTOCARPA. *Hedw.*

Rare. "Glenarm, and wall of Deer Park, Belfast."—Moore, Herb. Coll. Sc. Dublin. Wall near Castle Robin (Antrim).—Mr. J. Creeth. Not found in fruit.

161. E. CILIATA. *Hedw.*

In crevices of damp shady rocks—rare. "Benbradagh (Derry); Lurigethan, Agnew's Hill (Antrim)."—Moore, Herb. Coll. Sc. Dublin. In small quantity on basaltic cliffs, Sallagh Braes (Antrim).—S.A.S. 7-9.

162. E. VULGARIS. *Hedw.*

"Lurigethan—rare."—Moore, Herb. Coll. Sc. Dublin.

163. CINCLIDOTUS FONTINALOIDES. *Beauv.*

On stones in streams and lakes—frequent. "Common in Antrim."—Moore, Herb. Coll. Sc. Dublin. Shores of Lough Neagh, Bushmills, Glenarm, Glynn, Kilroot, Woodburn, Six-mile Water, Colin Glen (Antrim); Newtownards Glen (Down).—S.A.S.

164. TORTULA TORTUOSA. *Hedw.*

In dense swollen tufts, on rocks in shady places—frequent, most abundant on basalt. Slemish, Sallagh Braes, Knockagh, Belfast Hills (Antrim); Newtownards Glen, and on granite cliffs Slieve Donard (Down).—S.A.S. Barren.

165. T. SUBULATA. *Bridel.*

Dry banks, especially sand. Common in Derry, Antrim, and Down.

166. T. LATIFOLIA. *Br. and Schimp.*

At roots of trees in damp places—rare. Margin of the Lagan near Lisburn.—Mr. J. H. Davies. Sparingly on a willow tree in the Bog Meadows near Belfast.—S.A.S. Barren.

167. TORTULA INTERMEDIA. *Bridel.*

On rocks and stones—not rare. On trap rocks Blackhead, on trap and limestone Knockagh and Black Mountain, limestone at Waterloo near Larne (Antrim), intermixed with *T. lævipila.* On slate roofs in Ballywalter (Down).—S.A.S. 3-4.

168. T. LÆVIPILA. *Bridel.*

On trees and rocks, sometimes on walls—frequent. On limestone walls Moneymore, in fine fruit on sycamore tree at Magherafelt (Derry) November, 1874, on trees at Kilwaughter, on trap and limestone rocks Larne, Islandmagee, Black Mountain (Antrim); on trees at Purdysburn (Down).—S.A.S. 1-4.

169. T. RURALIS. *Dill.*

Sandy sea shores, roofs of houses, and sometimes on rocks—abundant in many places, but usually barren. Near Castle Robin, Lisburn.—Mr. J. Creeth. Sands at Red Bay (Antrim); on thatched roofs near Comber, Dromore, and Banbridge (Down); abundant on sandy shores and dunes all round the coast of Down.—S.A.S.

170. T. PRINCEPS. *De Notr.*

"Rare in Ireland; on the basaltic rocks in Deer Park, Glenarm."—Moore, Proc. R. I. Acad., Series II., Vol. I. No. 8.

171. T. FALLAX. *Hedw.*

Wet clay banks, old quarries, and sometimes on rocks—common. 12-3.

172. T. RIGIDULA. *Mitt.*

Rare. "Banks by the sea at Dunluce Castle."—Moore, Herb. Coll. Sc. Dublin." "The Glens, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Castle Robin, Lisburn (Antrim).—Mr. J. Creeth.

173. T. INSULANA. *De Notr.* T. vinealis, Var. *b.* flaccida. *Bryol. Brit.*

Wet places, and at roots of trees—rare. On stones in stream, Kilroot, in fruit, April, 1874; at root of tree, Derriaghy (Antrim); barren.—S.A.S.

174. T. VINEALIS. *Bridel.*

Rare. Near Lisburn.—Mr. J. H. Davies, Phytologist, N. S., Vol. III. Roadside, Derriaghy near Lisburn (Antrim); at base of Slieve Croob (Down).—S.A.S.

175. TORTULA HORNSCHUCHIANA. *Schultz.*

Very rare. "On the walls of the old castle at Carrickfergus, Co. Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. I have collected a moss growing on Carrick Castle, which seems to be this species, but I could find no fruit. Dr. Moore informs me that this moss was named *T. gracilis* by the late Dr. Taylor.

176. T. REVOLUTA. *Schwaeg.*

On walls—common. Carrickfergus, many places about Belfast, Derriaghy (Antrim); Donaghadee, Carrowdore (Down).—S.A.S. 4-5.

177. T. CONVOLUTA. *Hedw.*

Old walls and quarry debris—not uncommon, abundant where it occurs. Knockagh (Antrim); wall on Castlereagh Hill, quarry heaps Moira, in the greatest profusion on old walls near Legacurry, Hillsborough, walls Banbridge (Down).—S.A.S. 4-6.

178. T. UNGUICULATA. *Hedw.*

Clay banks, stone dykes, quarry heaps, and sometimes on walls—very common. 12-4.

179. T. MURALIS. *Timm.*

Walls and rocks—the commonest moss in the district. 1-5.

VAR. D. RUPESTRIS. A well marked form, and usually much larger—frequent on rocks in hilly districts.

180. T. LAMELLATA. *Lindb.* Pottia cavifolia, var. gracilis. *Bryol. Brit.*

In small quantity on ditch bank by roadside between Millisle and Ballywalter (Down).—S.A.S. In fruit, 2nd February, 1874.

181. T. ALOIDES. *Br. and Schimp.*

Clay banks and walls—not common. On trap debris near Blackhead and the Gobbins, ditch bank a little north of Trooper's Lane Station (Antrim); wall of bridge close to Dundonald Station, wall Ballylesson, clay bank near Drum Bridge, stone dyke People's Park, clay bank on roadside near Groomsport (Down).—S.A.S. 9-1.

182. T. AMBIGUA. *Wils.*

Debris of rocks, and sometimes on ditch banks. Squire's Hill.—Mr. H. Knight. Limestone debris, Whitewell; on new red sandstone, Derriaghy (An-

trim); ditch bank at foot of Scrabo Hill, Castlereagh Hill (Down).—S.A.S. 10-1.

183. TORTULA STELLATA. *Schreb.* T. rigida. *Shultz.*

"In Colin Glen, a little above the new bridge, April, 1838."—Moore, Herb. Coll. Sc. Dublin.

Tortula papillosa. Wils. Mr. J. H. Davies, of Glenmore, believes that he found this species on trees near Lisburn; but inasmuch as he has not preserved any specimens, it had better remain over for confirmation.

184. TRICHOSTOMUM CRISPULUM. *Bruch.*

On rocks—rare. "Sparingly at Black Cave near Larne."—Moore, Herb. Coll. Sc. Dublin. In small quantity on stone dyke at Sallagh Braes (Antrim). In fruit, October, 1874,—S.A.S.

185. T. BRACHYDONTIUM. *Bruch.* T. mutabile. *Br. and Schimp.*

"It occurs in considerable abundance on the basaltic rocks of Antrim, but generally barren."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

186. T. TOPHACEUM. *Bridel.*

Wet rocks and boggy heaths—not rare. "Moist banks near Dunluce, &c." —Moore, Herb. Coll. Sc. Dublin. "The Glens, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Bog on Benbradagh Mountain (Derry); rocks in stream Glenariff, wet rocks near Glynn, and at Woodburn Glen (Antrim); wet rocks Bangor (Down).—S.A.S. 12-4.

187. T. TORTILE. *Schrad.* Ditrichum pusillum. *Timm.*

"Near Belfast. Templeton, afterwards Drummond."—Flor. Hib. "In the late Mr. Templeton's garden, Cranmore, Belfast, 1837."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

188. T. HOMOMALLUM. *Br. and Schimp.*

Rare. Abundant and in fine fruit on decomposing granite by side Sluggada stream near Dart Mountain (Derry), July, 1869.—S.A.S.

189. DIDYMODON CYLINDRICUS. *Br. and Schimp.*

Shady and moist rocks—not uncommon. Sallagh Braes, Woodburn, Knockagh, Belfast Hills (Antrim); Dundonald Glen, Holywood Glen (Down). —S.A.S. 9-12.

190. DIDYMODON RUBELLUS. *Br. and Schimp.*

On walls, quarry heaps, and waste ground—very common in Antrim and Down. 10-2.

191. POTTIA STARKEANA. *Nees and Hornsch.*

Sandy and gravelly fields—not rare. Sydenham, Holywood, Crawfordsburn, Groomsport (Down).—S.A.S. I have not seen any peristome on our plant.

192. P. HEIMII. *Br. and Schimp.*

Not rare. Abundant in wet places, and on rocks at, or just above, high-water mark near Bangor, and several other places on the shores of Belfast Bay.—S.A.S. 4-5.

193. P. LITTORALIS. *Mitt.*

Very rare. Sparingly on ditch bank by roadside between Millisle and Ballywalter (Down).—S.A.S. I collected the specimens as *P. Wilsoni.* Mr. Hobkirk has, however, pointed out that they really belong to Mr. Mitten's *P. littoralis.* Not before recognised as Irish.

194. P. TRUNCATULA. *Linn.*

On damp ground, also on ditch banks and roadsides—very common throughout the district. 10-2.

195. CAMPYLOPUS PYRIFORMIS. *Bridel.* C. TORFACEOUS. *Br. and Schimp.*

Bogs and wet heaths—not rare. Bog on Benbradagh (Derry); Divis Mountain near Belfast (Antrim); rocky and heathy shore near Groomsport (Down).—S.A.S. Fruiting in the two former localities. 3-7.

196. C. FRAGILIS. *Br. and Schimp.*

On peaty banks and grassy heaths—frequent. In fine fruit on Agnew's Hill near Larne, also fruiting on Slieve True near Carrickfergus (Antrim); Conlig and Slieve Croob (Down).—S.A.S. 12-4.

VAR. B. DENSUS. Very frequent on mountains and in glens all through the district. I have not, however, seen it in fruit.

197. C. FLEXUOSUS. *Bridel.*

Rare. "Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. I have only met with specimens on Benbradagh Mountain (Derry), and Slemish (Antrim).—S.A.S. 5-7.

198. CAMPYLOPUS ALPINUS. *Schimp.*

"Cushendall, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

199. CERATODON CYLINDRICUS. *Br. and Schimp.*

Said to have been found near the Botanic Gardens, Belfast. I have not seen a specimen, nor do I know if any Irish specimens are in existence.

200. C. PURPUREUS. *Bridel.*

On waste ground, walls, banks, sandhills, and dry heaths—everywhere abundant. 3-5.

201. LEUCOBRYUM GLAUCUM. *Hampe.*

On heaths—not uncommon. "In bogs on the mountains—not rare in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Black Mountain and Mount Aughrim (Antrim).—Mr. J. Creeth. Conlig, Slieve Donard (Down).—S.A.S. Barren.

202. DICRANUM BONJEANII. *De Notr.* D. palustre. *Bridel.*

Rare. In the Archbishop's Wood, Portglenone."—Moore, Herb. Coll. Sc. Dublin. Near Lisburn.—Mr. J. Creeth.

203. D. MAJUS. *Turn.*

On damp banks in woods and heaths – frequent, but rare in fruit. Coming into fruit abundantly in Carndaisy Glen near Moneymore (Derry), 23rd Nov., 1874; Belfast Hills (Antrim); Holywood Hills (Down).—S.A.S.

204. D. SCOPARIUM. *Hedw.*

Shady places amongst heath on the hills, and on damp banks in woods and glens—very common. Fruiting, more or less, at nearly all seasons.

205. D. HETEROMALLUM. *Hedw.*

In woods and glens, sometimes on heaths and rocks—frequent. Lisburn.—Mr. J. Creeth. Fairhead, Larne, Cave Hill (Antrim); Knock, Portavo, Slieve Croob—abundant near summit Slieve Donard (Down), at 1,800 feet.—S.A.S. 10-3.

206. D. SUBULATUM. *Hedw.*

"Sides of Maryburn rivulet near Belfast, Templeton."—Flor. Hib. "In Glenariff, sparingly."—Moore, Herb. Coll. Sc. Dublin.

207. DICRANUM VARIUM. *Hedw.*

Ditch banks, under trees in woods, and on damp clay ground—very common. 11-3.

208. D. CERVICULATUM. *Schimp.*

In turf bogs—not common. "Only observed in a bog near Bruce's Castle, Rathlin."—Moore, Herb. Coll. Sc. Dublin. King's Moss between Belfast and Ballyclare (Antrim); Moneyreagh (Down). I also found this moss at Tartaraghan in the adjoining Co. of Armagh, and in Tyrone.—S.A.S. 6-7.

209. D. SQUAROSUM. *Schimp.*

On rocks by streams, and on wet stony heaths—rare. "Only observed in Glenariff."—Moore, Herb. Coll. Sc. Dublin. Rocky bank of stream, Meenard Mountain near Dungiven (Derry); Slemish Mountain, and heaths on Carrickfergus Commons (Antrim); on wet rocks Slieve Croob and Slieve Donard (Down). This latter is a remarkable and beautiful form, with stems three to four inches long, and very large loose leaf cells.—S.A.S. Barren as far as I have observed.

210. D. CRISPUM. *Schimp.*

Rare. "Near Belfast, Mr. Templeton."—Flor. Hib. On damp banks at Cregagh Glen on Castlereagh Hill (Down). The only locality where I have met this moss.—S.A.S.

211. D. PELLUCIDUM. *Hedw.*

Rocky banks of streams—frequent. "Larne, Templeton."—Flor. Hib. Glynn, Cave Hill, Colin Glen, and Crow Glen, in Belfast Hills (Antrim); little glen near Dundonald Station, Castlereagh Glen (Down)—S.A.S. 12-3.

212. CYNODONTIUM BRUNTONI. *Br. and Schimp.*

"Rare—only in one place in the Little Deer Park, Glenarm, Antrim."—Moore, Herb. Coll. Sc. Dublin.

213. BLINDIA ACUTA. *Br. and Schimp.*

Rare. "Near Belfast, Templeton."—Flor. Hib. "On wet banks and near waterfalls in northern glens, and on Slemish."—Moore, Herb. Coll. Sc. Dublin. Wet stony heaths, Slieve Croob (Down)—sparingly.—S.A.S.

214. SELIGERIA CALCAREA. *Br. and Schimp.*

On chalk rocks—very rare. Occurs in small quantity on fragments of limestone at intervals for about half a mile along the eastern slope of Black Mountain,

Belfast. I have also found it along with the next species on damp chalk rocks in Colin Glen (Antrim). The only Irish stations.—S.A.S. 3-5.

215. SELIGERIA PUSILLA. *Br. and Schimp.*

In crevices and fissures of chalk rocks—rare. "Near Belfast, Templeton—very rare."—Flor. Hib. "Near Belfast at Wolfhill, above the mill, in considerable abundance on the white limestone rocks; fruiting May, 1837. Also on shady limestone rocks above Lisburn. This rare and pretty little moss appears to be confined in Ireland to the white limestone rocks of Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Limestone of Sallagh Braes; not unfrequent on limestone in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. In small quantity in the Windy Gap in Crow Glen, on the eastern slopes of Black Mountain Belfast, near the lower waterfall Colin Glen (Antrim).—S.A.S. Fruiting at intervals from April till Oct. inclusive.

216. RHABDOWEISSIA FUGAX. *Br. and Schimp.*

Rare. "Sallagh Braes, Antrim; Benevenagh, Derry."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Slemish and Collon, rare."—Moore, Herb. Coll. Sc. Dublin.

217. WEISSIA VERTICILLATA. *Brid.*

Rare. Between Larne and Ballygally, occurring in dense tufts on chalk ocks near the Blackcove Tunnel (Antrim).—S.A.S.

218. W. CRISPULA. *Hedw.*

Very rare. "Shady rocks, Ballygally Head."—Moore, Herb. Coll. Sc. Dublin. Dr. Moore informs me that he collected the plant in the above locality in May, 1837; and that is believed to be the only station for it in Ireland.

219. W. CIRRHATA. *Hedw.*

"On wood of the locks of the Lagan Canal, May, 1838."—Moore, Herb. Coll. Sc. Dublin.

220. W. CONTROVERSA. *Hedw.*

On hedge banks, on the ground, and sometimes on rocks—very common everywhere. 12-4.

221. GYMNOSTOMUM MICROSTOMUM. *Hedw.*

Gravelly banks, waste ground, and fields—not at all common. Gravel bank Glenmachan, crevices of rocks on shore at Groomsport, and wet banks at same place, sandhills Newcastle (Down).—S.A.S. 2-6.

222. GYMNOSTOMUM CURVIROSTRUM. *Hedw.*

Rare. "Rocks at Fairhead, Mr. Templeton."—Flor. Hib. "Glen at Cushendall."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

223. G. RUPESTRE. *Schwæg.*

"Glens in Antrim—not rare."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

224. PHASCUM CRISPUM. *Hedw.*

"Banks near Belfast, Templeton."—Flor. Hib.

225. P. SUBULATUM. *Linn.*

In fields and on banks, especially where sandy or gravelly—frequent. Moneymore (Derry); Carnmoney Hill, White Mountain near Lisburn, Newforge (Antrim); Sydenham, Glenmachan, Castlereagh Hill, Mealough Hill (Down).—S.A.S. 2-4.

226. P. NITIDUM. *Hedw.*

"Banks near Belfast, Templeton."—Flor. Hib. "Rathlin, Aug., 1836." —Moore, Herb. Coll. Sc. Dublin.

227. P. PATENS. *Schimp.*

"On banks near Belfast, Templeton."—Flor. Hib.

228. P. CUSPIDATUM. *Schreb.*

"Hedge banks and sandy fields—not very common. Sydenham, Belmont, Giant's Ring (Down).—S.A.S. 1-3.

229. P. SERRATUM. *Schreb.*

"About Belfast—frequent, but rare elsewhere."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Rare—Rathlin, Aug., 1836."—Moore, Herb. Coll. Sc. Dublin.

230. SPHAGNUM SQUARROSUM. *Persoon.*

Bogs. "Not common in Antrim."—Moore, Herb. Coll. Sc. Dublin. In dense masses in wet bog near Moneyreagh (Down).—S.A.S. 6-7.

231. S. SUBSECUNDUM. *Nees and Hornsch.*

"Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

232. SPHAGNUM CUSPIDATUM. *Ehr.*

"Flow-bogs near Cloughmills."—Moore, Herb. Coll. Sc. Dublin. Boggy marsh near Hillsborough (Down).—S.A.S.

233. S. ACUTIFOLIUM. *Ehr.*

Wet bogs—common throughout the district.

234. S. RUBELLUM. *Wils.*

Not rare. "Collected by Templeton in the North."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Belfast Hills (Antrim); Conlig (Down).—S.A.S.

235. S. CYMBIFOLIUM. *Ehr.*

Peat bogs—common in Derry, Antrim, and Down. 6-7.

236. ANDRÆA RUPESTRIS. *Dill.* A. Rothii. *Web. and Moh.*

Rocks on the higher hills and mountains—not uncommon. "Abundant through Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. On granite, Slieve Donard; on slate, Slieve Croob (Down).—S.A.S. 4-7.

237. A. ALPINA. *Dill.*

Rocks on the mountains—abundant where it occurs. "Slemish."—Moore, Herb. Coll. Sc. Dublin. Plentiful on trap Slemish Mountain (Antrim); and on granite Slieve Donard (Down).—S.A.S. 4-6.

238. A. PETROPHILA. *Ehr.* A. rupestris. *Hedw.*

Wet mountainous rocks—not rare in such situations. "Abundant on Slemish, and other Antrim Mountains."—Moore, Herb. Coll. Sc. Dublin. Summits of Slieve Gallion (Derry), and Slieve Croob (Down).—S.A.S. 4-6.

A LIST OF THE

CRETACEOUS MICROZOA OF THE NORTH OF IRELAND,

By JOSEPH WRIGHT, F.G.S., F.R.G.S.I.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

From the way in which the Chalk of the North of Ireland has been hardened by heat and pressure, consequent on the overflow of the Basalt which everywhere in this country overlies the beds, geologists, until quite recently, had practically failed to find in our Irish Cretaceous rocks any of those beautiful Microzoa which so abound in the English Chalk.

So late as 1872 only one solitary Rhizopod had been recorded, viz., *Orbitolina concava*, found by Mr. Ralph Tate, F.G.S., in the Greensand. Mr. Thomas Galloway, of Belfast, had, however, also found a cast of *Dentalina communis* in flint near that place, and *Cristellaria rotulata* in the Greensand at Cave Hill, but had not recorded their occurrence. On the 13th of November, 1872, a paper was read before the Royal Geological Society of Ireland, by Professor T. Rupert Jones, F.R.S., on four carefully prepared slides of indurated Chalk, and one slide of Chalk flint, which were obtained from the North of Ireland, and had been submitted to him for examination by Professor Hull, Director of the Geological Survey in Ireland. Prof. Jones recognised in these specimens various sections of perfect and fragmentary Foraminifera, belonging to nine different species. In February, 1872, I discovered that the soft powdery material frequently found inside the cavities that often occur in flint, on being washed and cleaned, yielded Ostracoda, Foraminifera, and Sponge spicula, in great profusion; this powder being, in fact, a portion of the old sea bottom of the Cretaceous times. These tiny forms thus preserved in the flint cavities have remained uninjured, notwithstanding influences which converted the surrounding mud into solid limestone. I have since, in company with other members of the Club, examined personally a large portion of the Chalk area of

the North of Ireland, and in addition, through the kindness of Mr. Wm. Gray, M.R.I.A., Mr. S. A. Stewart, F.B.S.E., and Mr. Thomas Galloway, have had an opportunity of examining Chalk powder from 36 different localities in the Counties of Antrim, Londonderry, and Down. Among the many specimens collected from these various places, I have recognised, besides Corals and Polyzoa, 17 species of Ostracoda, 106 species and well marked varieties of Foraminifera, and 27 forms of Sponge spicula; many of these attain fine proportions, being much larger than those usually obtained from the washings of English Chalk. The Microzoa, on being placed in hydrochloric acid, were found to be, either not at all, or but very slightly affected by it, shewing that their original composition has, to a great extent, been replaced by silica. On account of the singular resemblance which many of those large flints known as "Paramoudras," bear to the deep sea siliceous sponge, *Holtenia Carpenteria*, I was specially desirous to obtain material from some of them for examination. Owing to their usually solid nature, this was difficult. I met, however, with several that were suitable, so that I was enabled to investigate the contents of four Paramoudras that were fossiliferous. The following is an analysis of those in question :—

No. 1, from Wolf Hill, near Belfast, 130 Spicula, 57 Foraminifera ; No. 2, from same locality, 130 Spicula, 8 Foraminifera ; No. 3, from Ballytober, Islandmagee, 5 Spicula, Foraminifera in great numbers ; No. 4, from Sallagh Braes, near Larne, Spicula in profusion, Foraminifera plentiful. The above results show that there is no appreciable difference between the contents of Paramoudras and ordinary flints. Both contain Sponge spicula in more or less abundance, the "Paramoudras" not being characterised by any special form of spiculum, which the others do not also contain. The one examined from Sallagh Braes yielded nearly all the different forms of spicula found in our Chalk powder, and in this respect closely resembled what was found in a small ordinary flint at Spring Hill, near Moneymore, Co. Derry ; whilst the "Paramoudra" from Ballytober, Islandmagee, though it contained Foraminifera and Ostracoda in abundance, had but very few spicula. From the general frequency of spicula in flints there cannot, however, I think, be any doubt but that most, if not all, of our nodular flints had their origin in a sponge, or some other soft organism round which the silica aggregated.

The Table given at the end must be considered as only an approximation to the general distribution of the Cretaceous Microzoa over the districts examined, the absence of many of the commoner species at some of the localities may be readily accounted for when we consider the small quantity of powder in some instances obtained. Thus at Larne, and at Spring Hill, near Moneymore, only a few grains of Chalk powder were found, several other localities also yielding but a very limited supply, whilst the flints at Woodburn quarry, as well as those on the shore between Blackhead and Gobbins, yielded, at a single visit, several pounds

weight of the material. Chalk flints are usually found hard and solid throughout, only a small proportion of them having cavities containing Chalk powder. So far as I have observed, those containing the powder appear to be confined to flints that have, for some time, been exposed to the action of the weather, the white material frequently seen in the interior of those newly quarried being always of a hard nature. I have met with Chalk powder in every stage, from powder as fine as the finest flour, to a material so hard that it was difficult to cut it with a penknife. The flints that contain powder may be readily known from the solid ones, by having openings from the outside varying much in size, the only trace at times being a little moss that has taken root on the chalky material exposed near the surface. It is not intended that the present list of Microzoa should be considered exhaustive, our knowledge of the contents of the flints in the North of Ireland is after all but very limited. Many localities in the northern parts of the Counties of Antrim and Londonderry have yet to be explored, whilst at several of the stations already examined the search for Chalk powder has been most cursory, and on several occasions only small samples of it were collected during hurried visits.

The Cretaceous rocks of the North of Ireland are found invariably underlying the Basalt, and are usually well exposed at the base of those hills which occupy the boundary line between it and the sedimentary rocks. They occur as a narrow belt of White Limestone and Greensand around the great basaltic plateau which occupies nearly all Co. Antrim and the eastern part of Co. Derry. I have given the localities for the Chalk Microzoa in the order in which they occur, commencing at Magheralin, the most south-westerly point examined ; and then, in a north-easterly direction, through Lisburn, Belfast, Carrickfergus, Islandmagee, to Larne ; then, north and north-west, round the coast to the Giant's Causeway ; then, inland, into Co. Londonderry, ending in the high escarpment of Slieve Gallion and Keady Hill.

To my friend, Prof. T. Rupert Jones, F.R.S., I am deeply indebted for kind assistance rendered by him in the critical examination of my entire collection of Ostracoda and Foraminifera—an examination which has resulted in the detection of several new species. I am further indebted to Prof. Jones for names and references respecting all the forms here enumerated. Dr. J. S. Bowerbank, F.R.S., has also laid me under weighty obligations, by generously undertaking to revise my whole series of Sponge spicula, a work of peculiar difficulty. His report on the spicula will be given in full. To my friends, Mr. William Gray, M.R.I.A., Mr. Samuel A. Stewart, F.B.S.E., and Mr. Thomas Galloway, I am indebted for kind and liberal assistance in procuring for examination a large amount of material from various localities. To the kindness and skill of my friend Mr. William Swanston I am much indebted for the very accurate drawings in the plates which accompany this memoir.

LIST OF LOCALITIES FROM WHICH CHALK MICROZOA HAVE BEEN OBTAINED:—

1. Magheralin, Co. Down. Quarry about 3 miles S.W. of Moira.

Chalk powder in limited quantity—very rich in Microzoa.

2. Moira, Co. Antrim. Quarry about half-a-mile N. of Moira station.

A considerable quantity of Chalk powder was got in the flints at this place; it contained, however, but few Microzoa, and these usually in poor condition. The powder was frequently found highly coloured, and appeared to have been much altered by the action of heat

3. Kilcorrig, Co. Antrim. Quarry about 3 miles N.W. of Lisburn.

A little powder was found here, very poor in Microzoa.

4. White Mountain, Co. Antrim, 1 mile N.E. of preceding locality.

A little Chalk powder was found at this station, it was poor in Microzoa. This is the only Irish locality where *Lituola inflata* has been found.

5. Colin Glen, Co. Antrim, about 4½ miles S.W. of Belfast.

A few flints were met with up this glen, which yielded a little Chalk powder, poor in Microzoa.

6. Black Hill, near Hannahstown, Co. Antrim. Quarry 3½ miles from Belfast, on the Hannahstown Road.

The Chalk powder found at this quarry was very rich in Microzoa. Two Foraminifera of great interest were met with, viz.: A new *Bulimina*, named by Prof. T. Rupert Jones *Bulimina regularis*—this species is extremely rare, only two specimens of it having as yet been found. The other, a Rotaline form, taking the shape of *Rotalia orbicularis*, with regular openings into each chamber; only one example of this remarkable Rhizopod has been found.

7. Wolf Hill, Co. Antrim. Quarry 2 miles N.W. of Belfast, near the village of Ligoniel.

The Chalk powder found here contained an abundance of the usual forms.

8. Squire's Hill. Quarries near the village of Ligoniel, and not far from the preceding station.

The Chalk powder found in the flints at these quarries yielded the ordinary Chalk Microzoa; Sponge spicules occurred in great abundance.

9. Cave Hill, Co. Antrim. Quarries 2 miles N. of Belfast.

On account of the close proximity of these extensive quarries to the town of Belfast, they have been better examined for Chalk powder than any of the other localities. In the rubbish heaps outside the quarries occur numbers of flints containing Chalk powder, rich in fossil Microzoa. Among the many rare forms found at this place the following may be mentioned as of special interest, viz.: *Lituola (Haplostiche) clavulina*, *Flabellina lingula*, *F. rugosa*, and *Lingulina carinata*.

10. Whitewell, Co. Antrim. Quarry 4 miles N. of Belfast, on the Antrim Road.

The Chalk powder found in the flints in this quarry was rich in the usual fossils. Two very rare Foraminifera were found here, viz.: *Marginulina seminotata*, and *Cristellaria (Saracenaria) Italica*.

11. Whiteabbey, Co. Antrim. Quarry 1 mile W. of Whiteabbey station on the Northern Counties Railway.

The Chalk powder collected from this quarry contained the usual Chalk Ostracoda and Foraminifera, but very few Sponge spicules.

12. Woodburn, Co. Antrim. Quarry at the head of Woodburn Glen, 2½ miles N.W. of Carrickfergus.

I only once visited this quarry, and whilst there collected several pounds weight of Chalk powder; it was found to contain Microzoa in great profusion. Many rare Foraminifera occurred, and all our Irish Chalk Ostracoda, with the exception of *Cythere Iernica*. *Vaginulina costulata* and *Gaudryina pupoides, var. prælonga*, were among the rare Foraminifera found here.

13. Whitehead, Co. Antrim. Quarry convenient to Whitehead station on the Northern Counties Railway.

A small quantity of Chalk powder was collected at this quarry, it contained the usual Chalk Microzoa; *Frondicularia inversa* has been found in this quarry.

14. Blackhead, Co. Antrim. 1½ miles N.E. of Whitehead station, rocks exposed along the shore under the headland.

A few flints were met with at this spot; they contained Chalk powder in quantity, which proved highly fossiliferous.

15. Near Gobbins. Rocks exposed along the shore about midway between that headland and Blackhead.

About midway between Blackhead and the Gobbins a dyke occurs well exposed in a low cliff, and is composed of a mass of ordinary flints and Paramoudras crowded together, and imbedded in a brown ochreous clay. These flints were found to contain Chalk powder in the greatest quantity—one of the "Paramoudras" examined yielded several pounds weight of the powder. The material collected proved extremely rich in Microzoa; all our Irish Cretaceous Ostracoda were met with, and an unusually large number of Foraminifera referable to 79 species and well marked varieties. The following very rare Foraminifera occurred, viz.: *Dentalina Steenstrupi*, *Marginulina seminotata*, and *Bulimina regularis*.

16. Ballytober, Islandmagee, Co. Antrim. Quarry situated near the centre of the island, between the Gobbins and Magheramorne ferry.

Chalk powder was found here in quantity; the Microzoa were in great abundance, and in fine preservation.

17. Mill Bay, Islandmagee, opposite Magheramorne, Co. Antrim. Quarry about quarter of a mile from the Magheramorne ferry.

The flints in this quarry yielded a fair supply of Chalk powder rich in the usual Microzoa.

18. Magheramorne, Co. Antrim. Quarry convenient to Magheramorne station, on the Northern Counties Railway.

The powder found in the flints in this quarry was highly fossiliferous.

19. Ballycarry, Co. Antrim. Quarry about half-a-mile S. of Ballycarry station, on the Northern Counties Railway.

A large quantity of Chalk powder, extremely rich in fossils, was found in this quarry; all the Cretaceous Ostracoda were met with, besides a great variety of Foraminifera and Sponge spicules.

20. Red Hall Glen, Co. Antrim. One mile N.W. of preceding locality.

Flints occur sparingly scattered over the bed of this fine old glen, having been washed out of the white limestone which at one place forms overhanging cliffs. Many of the flints were found to contain Chalk powder rich in Microzoa.

21. Glenoe, Co. Antrim. Quarry 3 miles S.W. of Magheramorne.

A small quantity of Chalk powder found here was rich in the usual forms.

Larne, Co. Antrim. Small quarry half-a-mile S. of the railway terminus at Larne.

A few grains of powder was found in a flint at this quarry; it contained the following fossils, viz.: *Cythere virginea*, *C. umbonata*, *Cythere (Cythereis) ornatissima*, *C. spiculata*, *Bairdia subdeltoidea*, *Cytherella ovata*, *C. Williamsoni*, *Paracypris gracilis*, *Dentalina marginuloides*, *Cristellaria rotulata*, *Textularia globulosa*, *Bulimina ovulum*, *B. brevis*, *Virgulina tegulata*, *Planorbulina ammonoides*, *Rotalia orbicularis*, *var.*

22. Waterloo, Co. Antrim. 1 mile N. of Larne, on the coast.

The Chalk powder at this place was highly fossiliferous; 15 different species of Ostracoda were found in it.

23. Sallagh Braes, Co. Antrim. Quarry 4½ miles N.W. of Larne, on the old road to Glenarm.

A "Paramoudra" was found here containing a quantity of Chalk powder; it yielded Sponge spicula in great profusion.

24. Glenarm, Co. Antrim. Quarries near the town of Glenarm, on the Coast road.

I am indebted to my friend Mr. Gray for the only Chalk powder I have seen from this place, as also for what was found at the following seven localities. As I have not visited any of these places myself, and as the samples submitted for examination were small, I can give no information as to relative quantity of the powder; all, however, were found to contain fossil Microzoa in more or less abundance.

25. Carnlough, Co. Antrim. Quarries 1 mile N.W. of the town on the Coast road, 2½ miles N. of Glenarm.

26. Garron Point, Co. Antrim. Quarry on the Coast road, 4½ miles N. of Carnlough.

27. Glenariff, Co. Antrim. Quarries 2½ miles up the glen from Red Bay, on the Coast road.

28. Lurigethan, Co. Antrim. Quarries on the face of a hill 2 miles from Cushendall, on the Coast road.

29. Trostan Mountain, Co. Antrim. Quarry on the north face of the mountain, 3 miles W. of Cushendall.

30. Torr Head, Co. Antrim. North-east corner of Co. Antrim, 11 miles N. of Cushendall, and 8 miles W. of Ballycastle.

31. Ballintoy, Co. Antrim. Quarries at Ballintoy Harbour, 5½ miles N.W. of Ballycastle, on the road to the Giant's Causeway.

32. Whiterocks, Co. Antrim. Quarries on the roadside 3 miles E. of Portrush, on the road to the Giant's Causeway.

A small quantity of Chalk powder collected at this quarry yielded a few Microzoa.

33. North of Moneymore, Co. Londonderry. Quarry about midway between that town and Magherafelt.

A little Chalk powder found in this quarry yielded a few fossils.

34. Springhill, near Moneymore, Co. Londonderry.

A few grains of Chalk powder collected at this quarry yielded vast numbers of Sponge spicules.

35. Slieve Gallion, Co. Londonderry. Quarry situated near the summit of the mountain, 4½ miles N.W. of Moneymore station on the Cookstown line.

This is the highest exposure of White Limestone in the North of Ireland, being at an elevation of 1,500 feet above the level of the sea. The Chalk powder collected at this quarry yielded Microzoa in great abundance and in fine preservation.

36. Keady Hill, Co. Londonderry. Quarries on the face of the hill, 3 miles E. of Newtownlimavady.

The Chalk powder collected at this quarry yielded Microzoa in great abundance.

LIST OF THE CRETACEOUS MICROZOA FOUND IN THE NORTH OF IRELAND.

OSTRACODA.

1. CYTHERE VIRGINEA, *Jones*. Frequent.

2. CYTHERE HARRISIANA, *Jones* (?). (Geol. Mag., Vol. VII., p. 75.) Frequent.

3. CYTHERE UMBONATA, *Williamson*. Frequent.

4. CYTHERE ? WRIGHTII, *sp. nov. Jones, MS.* (Near Bairdia difficilis, *Reuss* "Gaas," Pl. V., fig. 7). Not unfrequent.

5. CYTHERE ? IERNICA, *sp. nov. Jones, MS.* Rare.

6. CYTHERE (CYTHEREIS) ORNATISSIMA, *Reuss*. In great profusion.

7. CYTHERE (CYTHEREIS) ALATA, *Bosquet*. Frequent.

8. CYTHERE (CYTHEREIS) SPICULATA, *sp. nov. Jones, MS.* Frequent.

9. CYTHERE (CYTHEREIS) VALLATA, *sp. nov. Jones, MS.* (Near C. elongata, *Reuss*). Frequent.

10. CYTHERE (CYTHEREIS) MONTUOSA, *sp. nov. Jones, MS.* (Near C. oxyura, *Reuss*). Very rare.

11. CYTHERE (CYTHEREIS) CUSPIDIS, *sp. nov. Jones, MS.* (Near C. oxyura, *Reuss*). Abundant.

12. BAIRDIA SUBDELTOIDEA, *(Münster)*. In the greatest profusion.

13. MACROCYPRIS SILIQUA, *Jones*. Rare.

14. CYTHERELLA OVATA *(Römer)*. In the greatest profusion.

15. CYTHERELLA MUENSTERI, *(Römer)*. Rather frequent.

16. CYTHERELLA WILLIAMSONI, *Jones*. Very abundant.

17. PARACYPRIS ? GRACILIS, *Jones*. Rather frequent.

FORAMINIFERA IMPERFORATA.

MILIOLIDA.

18. TROCHAMMINA CRETACEA *(Reuss)*. Rare.

LITUOLIDA.

19. LITUOLA (HAPLOPHRAGMIUM) INFLATA, *Reuss*. Only two specimens found.

20. LITUOLA (HAPLOSTICHE) CLAVULINA, *Reuss* ("Elbthalgebirge," Pl. XXIV., fig. 7). Only one specimen found.

FORAMINIFERA PERFORATA.

LAGENIDA.

21. LAGENA APICULATA, *Reuss*. Rare.

22. LAGENA SULCATA, *W. & J.* Rather frequent.

23. NODOSARIA GLABRA, *D'Orb.*, and Dentaline variety. A long thin N. radicula *(Linn)*, passing into Dentalina nodosa, *D'Orb.* of his "Mémoire sur la Craie blanche, &c." (not D. nodosa of D'Orb. "Models"). Rather frequent.

24. NODOSARIA RADICULA *(Linn.)*, 3-chambered, thick (near Glandulina discreta, *Reuss;* G. cylindracea, *Alth.;* Marginulina bullata, *Reuss.*) Only one specimen found.

25. NODOSARIA RADICULA *(Linn.)*, tapering; N. lepida, *Reuss* ("Westphalia"). Rare.

26. NODOSARIA RADICULA *(Linn.)*, VAR. (near N. conferta.) Very rare.

27. NODOSARIA PYRULA, *D'Orb.* Rare.

28. NODOSARIA HISPIDA, *D'Orb.* Rather rare.

29. NODOSARIA RAPHANUS *(Linn.)*; N. Zippei, *Reuss.* Rather rare.

30. NODOSARIA RAPHANUS *(Linn.)*, VAR. INFLATA, *Reuss*. Frequent.

31. NODOSARIA RAPHANUS *(Linn.)*, short coarse variety. Abundant.

32. NODOSARIA RAPHANUS *(Linn.)*, small; N. obscura, *Reuss* ("Elbthalgebirge"). Rare.

33. NODOSARIA ACICULA, *Lam.*, slightly Dentaline, and thus passing into Dentalina obliqua *(Linn.)*. Frequent.

34. NODOSARIA (DENTALINA) LIMBATA, *D'Orb.* Rare.

35. DENTALINA COMMUNIS, *D'Orb.*, with oblique septa. Frequent.

36. DENTALINA COMMUNIS, *D'Orb.*, VAR. LORNEIANA, *D'Orb.*, passing into D. Boueana, *D'Orb.* Frequent.

37. DENTALINA COMMUNIS, *D'Orb.*, VAR. IRREGULARIS, *D'Orb.* The nearest figured specimen is Nodosaria monile, Von Hag., in Reuss' "Kreid. Böhm." t. 8. f. 9 (not f. 7. which, however, Reuss regards as the true "monile"); Dentalina nodosa, *D'Orb.*, "Mém. Craie blanche" (not Soldani) is probably the same; N. irregularis, *D'Orb.*, "For. Fos. Vien.," is the same with longer chambers; and N. longiscata, *D'Orb.*, has very elongate chambers of the same style. Rare.

38. DENTALINA COMMUNIS, *D'Orb.*, VAR.; D. Lilli, *Reuss* ("Kreid. Lemberg," Pl. II. fig. 11). Rather rare.

39. DENTALINA COMMUNIS, *D'Orb.*, exquisitely delicate var. near D. peracuta, *Reuss*. Rare.

40. DENTALINA COMMUNIS, *D'Orb.*, VAR. EMACIATA, *Reuss*. Very rare.

41. DENTALINA PAUPERATA, *D'Orb.*, with straight septa. In great profusion.

42. DENTALINA STEENSTRUPI, *Reuss* ("Meklenburg"). Only one specimen found.

43. DENTALINA NODOSA, *D'Orb.*, var. with flush and short chambers, marked with delicate lines, near D. nodosa, *D'Orb.* (Soldani); D. lineolata, *Reuss* ("Bohemia"); D. multilineolata, *Reuss* ("Elbthalgebirge"); D. proteus, *Reuss* ("Maestricht"); D. polyphragma, *Reuss* ("Westphalia"); Nodosaria subornata, *Reuss* ("Dobrutscha" f. 9, 10; the shape being that of f. 5, N. inarticulata, *Reuss*), and others. Rare.

44. DENTALINA MARGINULINOIDES, *Reuss* ("Lemberg," Pl. II. f. 12), subseptate variety. Rather rare.

45. DENTALINA MARGINULINOIDES, *Reuss*, cylindrical variety. Rather rare.

46. FRONDICULARIA STRIATULA, *Reuss* ("Elbthalgebirge," Pl. XXI. fig. 2). Frequent.

47. FRONDICULARIA AUGUSTATA, *Nilsson* (according to Reuss). A narrow sub-variety of F. striatula. Rare.

48. FRONDICULARIA VERNEUILIANA, *D'Orb.*, narrow variety. Rather rare.

49. FRONDICULARIA ARCHIACIANA, *D'Orb.* Frequent.

50. FRONDICULARIA TENUIS, *Reuss* ("Elbthalgebirge," Pl. XXI. f. 3). Rare.

51. FRONDICULARIA INVERSA, *Reuss.* Only one specimen found.

52. FRONDICULARIA ELLIPTICA (*Nilsson*). Very rare.

53, FRONDICULARIA MUCRONATA, *Reuss* ("Elbthalgebirge") VAR. with trifid mucro ; ? F. Goldfussi, *Reuss* ("Westphalia"). Rather rare.

54. FLABELLINA LINGULA, *Von Hagenow*, VAR. Only two specimens found.

55. FLABELLINA RUGOSA, *D'Orb.* Very rare.

56. FLABELLINA RETICULATA, *Reuss.* Frequent.

57. FLABELLINA PULCHRA, *D'Orb.* Very rare.

58. FLABELLINA PULCHRA, *D'Orb.*, narrow neat variety, near Fr. obliqua, *Von Münster.* Very rare.

59. FLABELLINA PULCHRA, *D'Orb.*, a smooth variety with parallel sides ; a narrow form of Fr. obliqua, *Alth* ("Lemberg"). Very rare.

60. FLABELLINA ORNATA, *Reuss* ("Kreid. Bohm.," Pl. XXIV. fig. 43) ; near Cristellaria crepidularis, *Reuss* ("Gault") ; ? F. Baudouiniana, *D'Orb.* Only one specimen found.

61. LINGULINA CARINATA, *D'Orb.* VAR.; broad and short. Only two specimens found.

62. MARGINULINA GLABRA, VAR. ELONGATA, *D'Orb.* Abundant.

63. MARGINULINA BULLATA, *Reuss* ("Westphalia" Pl. VI. fig. 4). Rather rare.

64. MARGINULINA RADICULA *(Linn.)*; smooth flush Nodosaria radicula with excentric aperture. Only one specimen found.

65. MARGINULINA SEMINOTATA, *Reuss* ("Westphalia Kreid.," Pl. V. fig. 6). Very rare.

66. MARGINULINA RAPHANUS *(Linn.)*; Nodosaria raphanus with excentric aperture. Only one specimen found.

67. VAGINULINA (MARGINULINA) TRILOBATA, *D'Orb.;* Marginulina bacillum, *Reuss*. Frequent.

68. VAGINULINA (CITHARINA) HARPA, *Röm.* VAR. NOV., near V. discors, *Reuss*, and V. arguta, *Reuss* ("Gault," Pl. III. fig. 10 and 12). Rare.

69. VAGINULINA COSTULATA, *Reuss*. Only one specimen found.

70. VAGINULINA COSTULATA, *Römer* (Reuss, "Elbthalgebirge," Pl. XX. fig. 24). Variety, thin and slightly curved. Only two specimens found.

71. PLANULARIA, SP. (near Planularia longa), *Cornuel*. Very rare.

72. PLANULARIA CREPIDULA, *D'Orb.*, becoming Flabellina pulchra, *D'Orb.* Very rare.

73. CRISTELLARIA RECTA, *D'Orb.* Rather rare.

74. CRISTELLARIA RECTA, *D'Orb.* VAR. HAMOSA, *Reuss* ("Elbthalgebirge," Pl. XXIV. flg. 2). Rare.

75. CRISTELLARIA RECTA, *D'Orb.* (near C. Bronni, *Römer*) (Reuss, "Gault," Pl. VII. f. 13). Only one specimen found.

76. CRISTELLARIA ROTULATA *(Lam.)*. In great profusion.

77. CRISTELLARIA NAVICULA, *D'Orb.* Rare.

78. CRISTELLARIA TRIANGULARIS, *D'Orb.* Very rare.

79. CRISTELLARIA (SARACENARIA) ITALICA, *Defrance*. Very rare.

80. CRISTELLARIA (SARACENARIA) ITALICA, *Defrance*, a long sub-variety. One specimen found.

81. POLYMORPHINA DAMÆCORNIS, *Reuss*, Pl. III. figs. 16 and 17. Very rare.

82. POLYMORPHINA HORRIDA, *Reuss*, Pl. III. figs. 14 and 15. Rather rare.

83. POLYMORPHINA FUSIFORMIS, *Römer.* Not unfrequent.

84. POLYMORPHINA REGINA, *B. P. & J.*, VAR. Very rare.

85. UVIGERINA NODOSA, *D'Orb.* Very rare.

GLOBIGERINIDA.

86. GLOBIGERINA CRETACEA, *D'Orb.* In great profusion.

87. GLOBIGERINA BULLOIDES, *D'Orb.* Very rare.

88. GLOBIGERINA BULLOIDES, *D'Orb.*, VAR. NOV., heaped. Very rare.

89. GLOBIGERINA MARGINATA *(Reuss).* Rare.

90. PULLENIA QUINQUELOBA *(Reuss).* Rather rare.

91. TEXTULARIA GIBBOSA, *D'Orb.* Rare.

92. TEXTULARIA PUPA, *Reuss* ("Westphalia"). Rather rare.

93. TEXTULARIA SAGITTULA, *Defrance.* Abundant.

94. TEXTULARIA TROCHUS, *D'Orb.* Rare.

95. TEXTULARIA TURRIS, *D'Orb.* Rare.

96. TEXTULARIA TURRIS, *D'Orb.*, short and thick varieties. Frequent.

97. TEXTULARIA FŒDA, *Reuss.* Frequent.

98. TEXTULARIA PRÆLONGA, *Reuss.* Rather rare.

99. TEXTULARIA GLOBULOSA, *Ehr.* In great abundance, but liable to be overlooked from its minute size.

100. VERNEUILINA TRIQUETRA, *(Münster).* Rather rare.

101. GAUDRYINA RUGOSA, *D'Orb.* Frequent.

102. GAUDRYINA PUPOIDES, *D'Orb.* VAR. PRÆLONGA *(Reuss).* Rare.

103. TRITAXIA TRIQUETRA *(Münster).* Rather rare.

104. BULIMINA PRESLI, *Reuss.* Frequent.

105. BULIMINA OVULUM, *Reuss.* Abundant.

106. BULIMINA BREVIS, *D'Orb.* In great abundance.

107. BULIMINA INTERMEDIA, *Reuss.* Rather rare.

108. BULIMINA REGULARIS, *sp. nov. Jones, MS.* (near B. marginata, *D'Orb.*). Only one good example found.

109. ? BULIMINA, SP. Very rare.

110. VIRGULINA TEGULATA, *Reuss*, VAR. In great abundance.

111. BOLIVINA DECORATA, *sp. nov. Jones, MS.* Very abundant.

112. BOLIVINA, SP. Exquisitely delicate form. Only one specimen found.

113. PLEUROSTOMELLA FUSIFORMIS, *Reuss* ("Westphalia"). Rare.

114. PLANORBULINA* EXSCULPTA, *Reuss* ("Westphalia"). Frequent.

115. PLANORBULINA AMMONOIDES *(Reuss).* In the greatest profusion.

116. PLANORBULINA AMMONOIDES *(Reuss)*, VAR. with extra shell-growth, making astral overgrowth on the umbilicus. In great profusion.

117. PLANORBULINA CRENULATA *(Reuss)*, ("Gaas," Pl. II. fig. 2). Rather rare.

118. TRUNCATULINA LOBATULA *(W. & J.).* Frequent.

119. PULVINULINA MICHELINIANA *(D'Orb.)* VAR. Frequent.

120. ROTALIA ORBICULARIS (*D'Orb.*), VAR. In great profusion.

121. ROTALIA vel PLANORBULINA? Pl. III. fig. 18. A Rotaline form, like R. orbicularis in shape, but having each chamber symmetrically perforated with a large central aperture on the outside. Only one specimen found. Prof. T. Rupert Jones says:—"This specimen is of great interest, when considered with the few other known *open-chambered* Foraminifera. Ehrenberg figures ('Mikrogeologie,' Pl. XIX. fig. 8), a *Pulvinulina* (?) having a symmetrical series of holes, one at the base of each chamber, around the large convex central chamber; and he figures some *Rotaliæ*

* Prof. W. K. PARKER, F.R.S., has kindly favoured us with his opinion on the *Rotalina* and some of the more obscure of the other *Foraminifera* of this list.

and *Planorbulinæ* with less regular holes. M. Vanden Broeck, of Brussels, has lately discovered a Lageniform 'porcellanous' Foraminifer with a regularly cribrate or latticed shell. Thus in both divisions of the *Foraminifera* we have open-chambered shells, *analogous* to the basket-like structure of the siliceous *Polycystina* (*Radiolaria*). How far these may be taken as indications of another, or other divisions of the Rhizopods, further research will show."

122. Fragments of tubular branched forms more or less aculeate near to the so called Dentalina (?) aculeata of D'Orbigny. My friend Professor T. Rupert Jones proposes to distinguish this simple, calcareous, subsegmented, branching, Nodosarian form by the "generic" name RAMULINA (from "ramulus," a little branch); the "species" above mentioned, which is common in the French and British chalk standing as Ramulina aculeata (*D'Orb.*), and our Irish form, which differs from D'Orbigny's in being smooth, as RAMULINA LÆVIS, *gen. et sp. nov. Jones*, see Pl. III. fig. 19. Rather rare.

123. RAMULINA BRACHIATA, *sp. nov. Jones*, see Pl. III. fig. 20. Very rare. Professor T. Rupert Jones says of this form that its nearest known analogue in external form among Protozoa is perhaps Dr. Wyville Thomson's *Cœlosphæra tubifex*, a peculiar Sponge from the North Atlantic. Still the fixed position of the tubes and the general aspect of the organism are against the probability of these Microzoa being closely allied.

SPONGE SPICULA.*

SKELETON-SPICULA.

124. Acerate spiculum, Pl. II. figs. 1 and 2. This form is found abundantly in the Halichondroid sponges both recent and fossil, but it is generally very minute. The same form also prevails to a great extent in the skeletons of many species of *Tethea* and *Geodia*, in both of which these spicula are of about the same size and form as those found in the Chalk, and I have no doubt that they are from fossil species of one or the other of these genera. Frequent.

125. Attenuato-acuate spiculum; an abnormal form, Pl. II. fig. 3. Very rare.

126. Moniliform attenuato-acuate spiculum, Pl. II. fig. 4. Rather frequent.

* I am indebted to J. S. BOWERBANK, LL.D., F.R.S., for the following report on the Sponge spicula.

127. Furcated porrecto-ternate moniliform spiculum, Pl. II. fig. 5. This is probably an external defensive spiculum from a Sponge closely allied to *Tethea*. I have seen from our southern Chalk the same form with moniliform shaft and radii, but not so distinctly banded. Rather rare.

128. Equiangular triradiate spiculum, Pl. II. fig. 6. This form occurs as a siliceous form rarely, but abundantly in the calcareous Sponges as skeleton spicula. Rare.

129. Spiculated equiangular triradiate spiculum, Pl. II. fig. 7. This occurs as a siliceous form rarely, but abundantly in the calcareous Sponges as internal defensive spicula.* Abundant.

CONNECTING-SPICULA.

130. Incipiently expanso-ternate spiculum, probably from a *Geodia*, Pl. II. fig. 8. It is not uncommon in our southern flints. Rare.

131. Expando-ternate spiculum; closely allied to the last, Pl. II. figs. 9 and 10. This form is found in recent *Tethea*, *Geodia*, and other genera. Frequent.

132. Expando-ternate spiculum, with cylindrical radii, Pl. II. figs. 11 and 12. This form is found in some recent species of *Tethea*, but is not a normal condition. Rather rare.

133. Furcated attenuato-patento-ternate spiculum, Pl. II. fig. 13. This constricted form of an apparently furcated attenuato-patento-ternate spiculum has not yet been found among recent Sponges. It occurs in our southern Chalk flints. Rather rare.

134. Furcated attenuato-patento-ternate spiculum, Pl. II. figs. 14 to 16. This form of spiculum abounds in the expansile dermal system of several of the siliceo-fibrous Sponges, as in that of *Dactylocalyx Bowerbankii*, Johnson (Proc. Zool. Soc. 1869, Pl. III. figs. 6, 7). These spicula vary in form and size to a considerable extent in the same species. In great profusion.

135. Furcated attenuato-patento-ternate spiculum, Pl. II. fig. 17; from the expansile dermal system of a siliceo-fibrous Sponge. In great profusion.

* This rarity of some of our forms of spicula in recent *siliceous* Sponges is of considerable interest, in connection with the fact that *all* the little organisms in the powder from our flints seem to be now silicified, whether they were originally *calcareous* (as the *Foraminifera* and *Ostracoda*) or not.

136. Furcated attenuato-patento-ternate spiculum, Pl. II. fig. 18; same as the last, but probably from a different species of Sponge. Frequent.

137. Recurvo-ternate spiculum, Pl. II. fig. 19; similar spicula occur in the intermarginal cavities of *Tethea* and *Geodia*, and these are probably from similar positions in the fossil species of these genera. Very rare.

138. Spiculum, Pl. III. fig. 1. This form is quite new to me. It is most probably from the expansile dermal system of a siliceo-fibrous Sponge. Rather rare.

139. Spiculum, Pl. III. figs. 2 and 3. Singular and probably abnormal form of dermal spiculum of a siliceo-fibrous Sponge. Rather rare.

140. Porrecto-ternate spiculum, Pl. II. fig. 20. This form of spiculum occurs in some species of *Tethea* (*Tethea cranium*, British). An external defensive spiculum. Frequent.

141. Porrecto-ternate spiculum, Pl. II. fig. 21. Very rare.

142. Porrecto-ternate spiculum, Pl. II. fig. 22; same as the last, but probably indicating a different species. Rather rare.

143. Attenuated rectangulate hexradiate spiculum, Pl. III. figs. 4 and 5, from a siliceo-fibrous Sponge (see "Mon. Brit. Spongiadæ," Vol. I. Pl. VII. fig. 174). In great profusion.

SKELETON-FIBRES.

144. Fragments of skeleton-fibres of a siliceo-fibrous Sponge, Pl. III. figs. 6 and 7. Very rare.

145. Apparently fragments of skeleton fibre of a siliceo-fibrous Sponge, Pl. III. figs. 8 and 9. Abundant.

146. Fragments of skeleton fibre of a siliceo-fibrous Sponge, Pl. III. fig. 10. Rare.

The following additional forms were found too late for insertion in the body of the report :—

SPONGE SPICULES.

147. Sphero-stellate spiculum, Pl. III. fig. 11. Very rare.

148. Recurvo-dentate quaternate spiculum, Pl. II. fig. 23. Very rare.

149. Spiculum? Pl. III. fig. 12. A spherical body ornamented with five delicate projecting limbs, three on the one plane and one at either end. Only one specimen found.

150. Spiculum? Pl. III. fig. 13. A spherical body covered with numerous projecting limbs. The few specimens found varied much in size.

FORAMINIFERA PERFORATA.

GLOBIGERINIDA.

151. SPIROPLECTA PRÆLONGA (*Reuss*). Zoologically the same as Spiroplecta sagittula (*Defrance*). Very rare.

TABLE SHEWING THE GEOGRAPHICAL DISTRIBUTION IN

	List of Species.	Magheralin. 1	Moira. 2	Kilcorrig. 3	White Mountain. 4	Colin Glen. 5	Black Hill. 6	Wolf Hill. 7	Squire's Hill. 8	Cave Hill. 9	Whitewell. 10	Whiteabbey. 11	Woodburn. 12	Whitehead. 13
	OSTRACODA.													
1.	Cythere virginea, *Jones*	x	..	x	..	x	x	x	..	x	x	x	x	x
2.	Cythere Harrisiana, *Jones* (?)	..	..	..	..	..	x	x	..	x	x	x	x	x
3.	Cythere umbonata, *Williamson*	x	..	..	..	..	x	..	..	x	x	x	x	x
4.	Cythere ? Wrightii, sp. nov. *Jones, MS.*	x	..	..	..	x	x	..	..	x	x	x	x	..
5.	Cythere ? Iernica, sp. nov. *Jones, MS.*	..	..	..	..	..	x	..	..	..	..	..	..	..
6.	Cythere (Cythereis) ornatissima, *Reuss*	x	x	..	..	..	x	x	..	x	x	x	x	x
7.	Cythere (Cythereis) alata, *Bosquet*	..	..	..	..	..	x	x	x	..	x	x	x	..
8.	Cythere (Cythereis) spiculata, sp. nov. *Jones*, MS.	..	..	..	..	..	..	x	..	..	..	..	x	..
9.	Cythere (Cythereis) vallata, sp. nov. *Jones, MS.*	x	..	..	..	..	x	x	..	x	..	x	x	..
10.	Cythere (Cythereis) montuosa, sp. nov. *Jones, MS.*	..	..	..	..	..	..	..	..	..	x	..	x	..
11.	Cythere (Cythereis) cuspidis, sp. nov. *Jones, MS.*	x	..	..	..	..	x	x	..	x	x	x	x	x
12.	Bairdia subdeltoidea, *(Munster)*	x	..	x	x	..	x	x	..	x	x	x	x	x
13.	Macrocypris siliqua, *Jones*	..	..	..	..	..	..	..	..	..	..	..	x	..
14.	Cytherella ovata, *(Romer)*	x	x	x	x	x	x	x	..	x	x	x	x	x
15.	Cytherella Muensteri, *(Romer)*	x	..	..	..	..	x	..	..	x	x	x	x	x
16.	Cytherella Williamsoni, *Jones*	x	..	..	x	..	x	x	..	x	x	x	x	x
17.	Paracypris ? gracilis, *Jones*	..	..	..	x	x	x	..	..	..	x	..	x	..
	FORAMINIFERA.													
18.	Trochammina cretacea, (*Reuss*)	x	..	..	..	..	..	..	..	x	..	..	..	..
19.	Lituola (Haplophragmium) inflata, *Reuss*	..	..	..	x	..	..	x	..	..	..	..	..	..
20.	Lituola (Haplostiche) clavulina, *Reuss*	..	..	..	..	..	..	..	..	x	..	..	..	..
21.	Lagena apiculata, *Reuss*	x	..	..	x	..	x	x	..	x	..	x	..	..
22.	Lagena sulcata. *W. & J.*	..	..	..	..	..	..	..	..	..	x	..	x	..
23.	Nodosaria glabra, *D'Orb.*	x	x	..	..	..	x	x	..	x	x	x	x	..
24.	Nodosaria radicula *(Linn.)*, (3 chambered, thick)	..	..	..	..	..	..	..	..	..	x	..	..	..
25.	Nodosaria radicula *(Linn.)*, (tapering)	..	..	..	..	..	..	..	..	..	..	..	..	..
26.	Nodosaria radicula *(Linn.)*, var. near N. conferta	..	..	..	..	..	..	..	..	..	..	..	x	..
27.	Nodosaria pyrula, *D'Orb.*	..	..	..	..	..	..	..	x	..	..	..	..	..
28.	Nodosaria hispida, *D'Orb*	..	..	..	..	..	..	..	..	..	..	x	x	x
29.	Nodosaria raphanus, *(Linn.)*	x	x	..	x	..	..	..	..	x	x	x	x	..
30.	Nodosaria raphanus *(Linn.)*, var. inflata, *Reuss*	x	..	x	..	..	x	x	..	x	x	x	x	..
31.	Nodosaria raphanus *(Linn.)*, short coarse variety	x	x	..	..	..	..	x	..	x	x	x	x	x
32.	Nodosaria raphanus (*Linn.*), (small)	..	..	..	..	..	..	..	..	x	x	..	x	..
33.	Nodosaria acicula, *Lam.*	..	..	x	..	..	x	x	..	x	x	x	x	..
34.	Nodosaria (Dentalina) limbata, *D'Orb.*	x	..	..	..	x	..	..	..	..	x	x	x	..
35.	Dentalina communis, *D'Orb.*	x	..	..	..	..	x	x	..	x	x	x	x	x
36.	Dentalina communis, *D'Orb.*; var. Lorneiana, *D'Orb*	..	..	..	..	..	x	x	..	x	..	x	x	x
37.	Dentalina communis, *D'Orb.*; var. irregularis *(D'Orb.)*	..	..	..	..	..	..	..	..	..	x	..	x	..

NORTH OF IRELAND OF THE CRETACEOUS MICROZOA.

Near Gobbins. 15	Ballytober. 16	Near Mill Bay. 17	Magheramorne. 18	S. of Ballycarry. 19	Redhall Glen. 20	Glenoe. 21	Waterloo. 22	Sallagh Braes. 23	Glenarm. 24	Carnlough. 25	Garron Point. 26	Glenariff. 27	Lurigethan. 28	Trostan Mtn. 29	Torr Head. 30	Ballintoy. 31	White Rocks. 32	N. of Moneymore 33	Spring Hill. 34	Slieve Gallion. 35	Keady Hill. 36	
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	..	x	x	x	x	1.
x	x	x	x	x	x	..	x	..	x	x	..	..	x	x	x	x	..	..	..	..	..	2.
x	x	x	x	x	x	x	x	x	x	x	..	x	x	x	..	x	..	..	x	x	x	3.
x	x	x	x	x	x	..	..	x	x	x	..	x	x	..	..	x	..	..	x	x	x	4.
x	..	..	..	x	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	x	..	5.
x	x	x	x	x	x	x	x	x	x	x	..	x	x	..	x	x	x	x	x	x	x	6.
x	x	x	x	x	x	x	x	x	..	..	..	x	..	x	..	..	..	..	..	x	x	7.
x	x	x	x	x	..	x	x	..	x	..	x	..	..	x	..	..	..	..	..	..	..	8.
x	x	x	x	x	x	x	x	..	x	x	x	x	x	..	..	x	..	..	x	x	x	9.
x	..	..	..	x	..	x	x	..	x	..	..	x	..	..	..	..	..	..	x	..	..	10.
x	x	x	x	x	x	x	x	x	x	x	..	x	x	..	x	..	..	..	x	x	x	11.
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	..	x	x	x	12.
x	x	..	x	x	..	x	x	..	..	..	..	..	..	..	..	..	..	..	x	x	x	13.
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	14.
x	x	x	x	x	..	x	x	x	x	..	..	..	x	x	x	x	..	..	..	x	x	15.
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	..	..	..	x	x	x	16.
x	x	x	x	x	x	x	x	x	..	x	..	x	x	..	..	..	..	..	..	x	x	17.
..	x	x	x	x	..	..	..	..	..	..	..	..	..	..	..	x	..	..	x	x	x	18.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	19.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20.
x	..	..	..	..	..	..	..	x	..	x	..	..	..	..	..	..	..	..	..	x	x	21.
x	x	x	x	x	..	x	..	..	x	x	..	..	..	x	..	..	x	..	..	x	x	22.
x	x	x	x	x	..	x	x	x	x	x	..	..	..	..	..	..	..	..	x	x	x	23.
x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	24.
x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	x	25.
x	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	x	26.
..	x	..	..	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	27.
x	..	x	x	x	x	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	28.
x	x	x	x	x	..	..	x	x	x	..	..	x	x	x	..	..	x	x	..	x	x	29.
x	x	..	x	x	..	..	..	..	..	x	..	..	x	..	..	..	..	..	..	..	..	30.
x	x	x	x	x	x	..	x	x	x	x	..	x	x	..	..	x	x	..	..	x	x	31.
x	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	x	..	..	32.
x	x	..	..	..	x	x	x	x	..	..	..	..	..	x	..	..	..	..	..	..	..	33.
..	x	..	..	x	..	..	x	x	..	x	..	..	..	..	..	..	..	..	..	..	..	34.
x	x	x	x	x	x	x	x	x	x	x	..	x	x	..	..	x	..	..	x	x	x	35.
x	..	x	..	..	..	..	..	x	x	.	..	..	..	..	..	x	..	..	..	x	x	36.
x	..	..	..	x	..	..	..	..	..	..	..	..	x	..	..	..	..	..	..	..	..	37.

TABLE SHEWING THE GEOGRAPHICAL DISTRIBUTION IN TH

	List of Spec es.	Magheralin. 1	Moira. 2	Kilcorrig. 3	White Mountain. 4	Colin Glen. 5	Black Hill. 6	Wolf Hill. 7	Squire's Hill. 8	Cave Hill. 9	Whitewell. 10	Whiteabbey. 11	Woodburn. 12	Whitehead. 13
38.	Dentalina communis, *D'Orb.*; var. Lilli, *Reuss*	..	..	..	..	..	..	x	..	x	..	..	x	..
39.	Dentalina communis, *D'Orb.*, exquisitely delicate variety	..	..	..	..	..	..	x	..	x	x	x	x	..
40.	Dentalina communis, *D'Orb.*; var. emaciata, *Reuss*	..	..	..	..	..	..	..	..	..	..	..	..	..
41.	Dentalina pauperata, *D'Orb.*	x	x	..	x	x	x	x	..	x	x	x	x	x
42.	Dentalina Steenstrupi, *Reuss*	..	..	..	..	..	..	..	..	..	..	..	..	..
43.	Dentalina nodosa, *D'Orb.*, var.	..	..	..	..	..	..	..	..	..	x	x	x	x
44.	Dentalina marginulinoides, *Reuss*. Subseptate variety	x	x	..	..	..	..	..	..	..	..	..	x	..
45.	Dentalina marginulinoides, *Reuss*. Cylindrical variety	..	..	..	..	..	..	..	..	..	..	..	..	..
46.	Frondicularia striatula, *Reuss*	..	..	..	..	..	x	..	x	..	x	x	x	..
47.	Frondicularia angustata, *Nilsson*	..	..	..	..	..	..	..	..	x	..	..	..	..
48.	Frondicularia Verneuiliana, *D'Orb*	..	..	..	..	..	..	..	..	x	..	..	x	..
49.	Frondicularia Archiaciana, *D'Orb.*	x	..	..	..	..	x	..	..	x	x	..	x	..
50.	Frondicularia tenuis, *Reuss*	..	..	..	..	..	..	..	..	x	..	..	x	..
51.	Frondicularia inversa, *Reuss*	..	..	.	..	..	..	..	..	..	..	..	..	x
52.	Frondicularia elliptica *(Nilsson)*	..	..	..	..	..	..	..	..	x	..	..	x	..
53.	Frondicularia mucronata, *Reuss*, var.	x	..	..	..	..	x	..	..	x	x	..	x	x
54.	Flabellina lingula, *Von Hagenow*, var.	..	..	..	..	..	x	..	..	x	..	..	..	..
55.	Flabellina rugosa, *D'Orb.*	..	..	..	..	..	..	..	..	x	..	..	..	..
56.	Flabellina reticulata, *Reuss.*	x	..	..	..	..	x	x	..	x	x	x	x	..
57	Flabellina pulchra, *D'Orb.*	..	..	..	..	..	..	..	..	x	..	..	..	..
58	Flabellina pulchra, *D'Orb.* Narrow neat variety	..	..	..	..	..	..	..	..	..	..	..	x	..
59.	Flabellina pulchra, *D'Orb.* Smooth variety with parallel sides	..	..	..	..	..	..	..	..	..	..	..	x	..
60.	Flabellina ornata, *Reuss*	..	..	..	..	..	..	..	..	..	..	..	..	..
61.	Lingulina carinata, *D'Orb.*, var.	..	..	..	..	..	..	..	..	x	..	..	..	..
62.	Marginulina glabra, var. elongata, *D'Orb*	..	..	..	..	..	x	x	..	x	x	x	x	..
63.	Marginulina bullata, *Reuss.*	..	..	..	..	..	..	..	..	..	..	..	..	..
64.	Marginulina radicula *(Linn.)*	..	..	..	..	..	..	..	..	x	..	..	..	..
65.	Marginulina seminotata, *Reuss*	..	..	..	..	..	..	..	..	..	x	..	..	..
66.	Marginulina raphanus *(Linn.)*	..	..	..	..	..	..	..	..	x	..	..	..	..
67.	Vaginulina (Marginulina) trilobata, *D'Orb.*	..	..	..	..	..	x	x	..	x	x	..	x	..
68.	Vaginulina (Citharina) harpa, *Rom.*, var. nov.	..	..	..	..	..	..	..	..	..	..	..	x	..
69.	Vaginulina costulata, *Reuss.*	..	..	..	..	..	..	..	..	..	..	..	x	..
70.	Vaginulina costulata, *Rom.* Variety thin and slightly curved	..	..	..	..	..	..	..	..	x	..	..	x	..
71.	Planularia sp., near Planularia longa, *Cornuel.*	..	..	..	..	..	..	..	..	..	..	..	..	x
72.	Planularia crepidula, *D'Orb.*, becoming Flabellina pulchra, *D'Orb.*	..	..	..	..	..	x	..	..	..	..	..	..	..
73.	Cristellaria recta, *D'Orb*	x	..	..	..	x	x	x	..	x	x	..	x	..
74.	Cristellaria recta, *D'Orb.*; var. hamosa, *Reuss.*	..	..	..	..	..	..	..	..	..	..	..	..	..
75.	Cristellaria recta, *D'Orb.*, near C. Bronni	..	..	..	..	..	..	..	..	x	..	..	..	..
76.	Cristellaria rotulata *(Lam.)*	x	x	x	x	x	x	x	..	x	x	x	x	x
77.	Cristellaria navicula, *D'Orb.*	x	..	..	..	..	..	x	..	..	..	..	x	..
78.	Cristellaria triangularis, *D'Orb*	x	..	..	..	..	..	..	..	..	..	x	x	..
79.	Cristellaria (Saracenaria) Italica, *Defrance*	..	..	..	..	..	..	..	..	..	x	..	..	..
80.	Cristellaria (Saracenaria) Italica, *Defrance*, long sub-variety	..	..	..	..	..	..	..	..	x	..	..	..	..
81.	Polymorphina damæcornis, *Reuss.*	..	..	..	..	..	..	..	..	..	..	..	..	..

NORTH OF IRELAND OF THE CRETACEOUS MICROZOA—*(Continued)*.

Blackhead.	Near Gobbins.	Ballytober.	Near Mill Bay.	Magheramorne.	S. of Ballycarry.	Redhall Glen.	Glenoe.	Waterloo.	Sallagh Braes.	Glenarm.	Carnlough.	Garron Point.	Glenariff.	Lurigethan.	Trostan Mtn.	Torr Head.	Ballintoy.	White Rocks.	N. of Moneymore	Spring Hill.	Slieve Gallion.	Keady Hill.	
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
..	..	..	..	..	x	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	x	x	38.
x	x	..	..	x	x	..	..	..	..	..	..	..	..	x	..	..	..	..	..	..	..	x	39.
..	x	..	..	x	..	..	..	x	x	..	..	..	..	x	..	..	..	..	..	..	x	x	40.
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	41.
..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	42.
..	x	x	x	x	x	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	x	..	43.
..	x	..	..	x	x	..	..	x	..	..	..	..	..	..	..	..	x	..	..	..	..	..	44.
..	x	..	..	..	x	..	..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	45.
x	x	x	x	x	x	x	x	x	..	..	..	..	..	x	x	x	..	..	..	..	..	x	46.
x	x	x	..	..	x	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	47.
x	x	..	..	..	x	..	x	..	..	x	..	..	..	..	..	..	..	..	..	..	x	..	48.
..	x	x	..	..	..	x	x	..	..	..	..	..	..	x	x	..	..	..	..	..	x	..	49.
..	x	..	..	..	..	..	..	x	x	x	..	..	..	..	..	..	..	..	..	..	..	..	50.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	51.
..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	52.
..	x	x	..	x	x	x	..	x	x	x	..	..	x	x	..	..	..	..	..	..	..	x	53.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	54.
..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	55.
..	x	x	x	x	..	..	x	x	x	x	..	..	..	..	..	..	..	..	..	x	x	x	56.
..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	57.
..	x	..	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	58.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	x	59.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	x	..	..	..	..	..	..	60.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	61.
..	x	x	..	x	x	x	..	x	x	x	..	x	..	x	..	..	..	x	..	..	x	x	62.
..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	63.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	64.
..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	65.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	66.
..	x	..	..	..	x	..	..	..	..	..	..	x	..	..	..	..	..	..	..	..	..	x	67.
..	x	..	..	..	x	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	68.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	69.
..	..	..	x	..	..	..	..	..	..	..	..	..	x	..	..	..	..	..	..	..	..	..	70.
..	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	71.
..	x	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	72.
..	x	x	..	..	..	..	..	x	x	..	..	..	..	..	..	..	x	..	..	..	..	x	73.
..	..	..	..	..	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	74.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	75.
x	x	x	x	x	x	x	x	x	x	x	x	x	..	x	..	x	x	x	..	x	x	x	76.
..	x	..	x	x	x	..	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	77.
..	x	..	..	..	..	..	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	78.
..	..	x	..	x	x	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	79.
..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	80.
..	x	..	..	x	x	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	81.

TABLE SHOWING THE GEOGRAPHICAL DISTRIBUTION IN THI

	List of Species.	Magheralin. 1	Moira. 2	Kilcorrig. 3	White Mountain. 4	Colin Glen. 5	Black Hill. 6	Wolf Hill. 7	Squire's Hill. 8	Cave Hill. 9	Whitewell. 10	Whiteabbey. 11	Woodburn. 12	Whitehead. 13
82.	Polymorphina horrida, *Reuss.*	..	..	..	..	..	..	x	..	x	x	..	x	..
83.	Polymorphina fusiformis, *Romer*	..	..	..	..	x	x	..	..	x	x	x	x	..
84.	Polymorphina regina, *B. P. & J.*, var.	..	..	..	..	..	..	..	..	..	..	..	..	..
85.	Uvigerina nodosa, *D'Orb.*	..	..	..	..	..	..	..	..	..	..	..	..	..
86.	Globigerina cretacea, *D'Orb.*	x	x	..	..	x	x	x	..	x	x	x	x	..
87.	Globigerina bulloides, *D'Orb*	x	..	..	..	..	..	x	..	..	..	..	..	..
88.	Globigerina bulloides *D'Orb.*, var. nov., heaped	..	..	..	..	..	x	..	..	..	..	..	..	..
89.	Globigerina marginata *(Reuss)*	..	..	..	..	..	..	..	..	x	..	x	x	..
90.	Pullenia quinqueloba *(Reuss)*	x	..	..	..	..	..	..	..	x	x	x	x	x
91.	Textularia gibbosa, *D'Orb.*	..	..	..	..	..	..	..	..	..	..	x	..	..
92.	Textularia pupa, *Reuss.*	x	..	..	x	..	..	..	..	..	..	x	x	..
93.	Textularia sagittula, *Defrance*	x	x	..	x	..	x	..	..	x	x	x	x	x
94.	Textularia trochus, *D'Orb.*	..	..	..	..	..	..	..	..	..	..	..	..	..
95.	Textularia turris, *D'Orb*	..	..	..	x	..	..	..	..	..	..	..	x	..
96.	Textularia turris, *D'Orb.*, short and thick variety	x	x	..	..	..	x	x	..	x	..	x	x	x
97.	Textularia fœda, *Reuss.*	x	x	..	..	..	..	x	..	x	x	x	x	..
98.	Textularia prælonga, *Reuss.*	..	..	..	x	..	..	..	..	..	..	..	x	..
99.	Textularia globulosa, *Ehr*	x	..	..	..	x	x	..	..	x	x	x	..	x
100.	Verneuilina triquetra *(Munster)*	x	..	..	..	..	..	..	..	..	x	x	x	..
101.	Gaudryina rugosa, *D'Orb.*	..	..	..	..	..	..	..	..	..	..	x	x	..
102.	Gaudryina pupoides, *D'Orb.*; var. prælonga, *Reuss*	..	..	..	..	..	..	..	..	..	..	..	x	..
103.	Tritaxia triquetra *(Munster)*	..	x	..	..	..	..	..	..	..	..	..	..	..
104.	Bulimina Presli, *Reuss*	x	..	..	x	..	..	..	..	..	x	x	x	..
105.	Bulimina ovulum, *Reuss*	x	x	x	x	..	x	x	..	x	x	x	x	x
106.	Bulimina brevis, *D'Orb.*	x	x	x	x	x	x	x	..	x	x	x	x	x
107.	Bulimina intermedia, *Reuss.*	..	..	..	..	..	..	..	..	x	..	..	x	..
108.	Bulimina regularis, sp. nov. *Jones, MS*	..	..	..	..	..	x	..	..	..	..	..	..	..
109.	? Bulimina sp.	x	..	..	..	..	..	..	..	..	..	..	..	..
110.	Virgulina tegulata, *Reuss*, var.	x	..	x	..	x	x	x	..	x	x	x	x	x
111.	Bolivina decorata, sp. nov. *Jones, MS*	x	x	..	..	..	x	x	..	x	x	x	x	..
112.	Bolivina, sp.	..	..	..	..	..	..	..	..	..	..	..	..	..
113.	Pleurostomella fusiformis, *Reuss*	x	..	..	..	..	x	x	..	x	x	x	x	..
114.	Planorbulina exsculpta, *Reuss*	x	..	..	..	..	x	x	..	x	x	x	x	x
115.	Planorbulina ammonoides *(Reuss.)*	x	x	x	x	x	x	x	..	x	x	x	x	x
116.	Planorbulina ammonoides *(Reuss)*, var. with extra shell-growth	x	x	x	x	x	x	x	..	x	x	x	x	x
117.	Planorbulina crenulata *(Reuss)*	x	..	..	..	..	x	x	..	x	x	x	x	..
118.	Truncatulina lobatula *(W. & J.)*	x	..	..	x	..	x	x	..	..	..	x	x	..
119.	Pulvinulina Micheliniana *(D'Orb.)*	x	..	x	x	x	..	x	..	x	x	x	x	x
120.	Rotalia orbicularis *(D'Orb.)*, var.	x	x	..	x	..	x	x	..	x	x	x	x	x
121.	Rotalia vel Planorbulina ?, with each chamber symmetrically perforated	..	..	..	..	..	x	..	..	..	..	..	..	..
122.	Ramulina lævis, gen. et sp. nov. *Jones*	..	..	..	..	..	..	..	..	..	..	..	x	..
123.	Ramulina brachiata, sp. nov. *Jones*	..	..	..	..	..	..	..	..	..	..	..	..	..
	SPONGE SPICULA, &c.													
124.	Acerate spiculum. Pl. II., figs. 1 & 2.	..	..	..	x	x	..	..	..	x	..	..	..	..
125.	Attenuato-acuate spiculum. Pl. II., fig. 3	x	..	..	..	x	x	x	..	x	x	..	x	..
126.	Moniliform attenuato-acuate spiculum. Pl. II., fig. 4	..	..	..	..	..	..	x	..	x	..	x	x	..
127.	Furcated porrecto-ternate moniliform spiculum Pl. II., fig. 5	..	x	..	..	..	x	x	..	x	..	..	..	..

ORTH OF IRELAND OF THE CRETACEOUS MICROZOA—*(Continued).*

Near Gobbins. 15	Ballytober. 16	Near Mill Bay. 17	Magheramorne. 18	S. of Ballycarry. 19	Redhall Glen. 20	Glenoe. 21	Waterloo. 22	Sallagh Braes. 23	Glenarm. 24	Carnlough. 25	Garron Point. 26	Glenariff. 27	Lurigethan. 28	Trostan Mtn. 29	Torr Head. 30	Ballintoy. 31	White Rocks. 32	N. of Moneymore 33	Spring Hill. 34	Slieve Gallion. 35	Keady Hill. 36	
X	X	X	X	X	..	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	82.
X	X	X	X	X	..	X	..	..	X	..	..	X	..	..	..	..	..	..	X	X	X	83.
X	..	..	..	..	X	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	X	84.
..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	85.
X	X	X	X	X	X	X	X	X	X	X	X	X	X	..	X	X	..	X	X	X	X	86.
..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	87.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	X	88.
X	X	X	X	X	..	X	X	..	..	X	..	X	..	..	..	X	..	..	..	X	X	89.
X	X	X	X	X	..	..	X	X	..	X	..	X	X	..	..	..	..	X	..	..	X	90.
X	X	X	..	X	X	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	91.
X	X	X	..	X	X	X	X	..	X	..	..	..	..	..	..	..	..	..	..	..	..	92.
X	X	X	..	X	..	X	X	X	X	X	..	..	..	..	X	X	..	..	X	X	X	93.
..	X	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	94.
X	X	X	X	X	..	..	..	..	..	X	..	..	X	..	..	..	..	..	..	X	..	95.
X	X	..	X	X	..	X	X	X	X	X	..	..	X	X	..	..	X	X	..	..	X	96.
X	X	X	..	X	..	..	X	X	X	..	X	..	X	..	..	X	..	..	X	X	X	97.
X	..	..	..	..	..	X	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	98.
X	X	X	X	X	X	X	X	X	X	X	..	X	X	X	X	X	..	..	X	X	X	99.
X	X	X	X	X	..	..	X	X	X	X	..	..	..	..	..	..	X	..	..	X	X	100.
X	..	..	..	..	..	..	..	..	..	..	..	X	..	..	X	..	..	..	..	..	..	101.
X	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	102.
X	..	..	X	..	..	X	..	X	..	X	..	..	..	..	X	..	X	..	..	..	X	103.
X	X	X	..	X	..	X	..	X	X	X	..	X	X	..	..	..	..	..	..	..	X	104.
X	X	X	X	X	X	X	X	X	X	X	..	X	X	..	..	..	X	..	..	..	X	105.
X	X	X	X	X	X	..	X	X	X	X	..	X	X	X	..	..	..	X	..	X	X	106.
X	X	X	..	X	..	..	..	X	..	..	..	..	X	..	..	..	..	..	..	..	..	107.
X	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	108.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	109.
X	X	X	X	X	X	X	X	X	..	X	..	X	X	..	..	X	X	..	X	X	X	110.
X	X	X	X	X	..	X	X	X	..	X	..	X	X	..	X	..	X	X	..	X	X	111.
..	..	..	..	X	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	112.
X	X	..	X	X	X	..	X	..	..	..	..	..	..	..	..	..	..	..	X	..	X	113.
X	X	X	X	X	X	X	X	X	..	X	..	X	X	..	X	..	..	..	X	X	X	114.
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	115.
X	X	X	X	X	X	X	X	X	X	X	X	..	X	X	..	X	X	..	X	..	X	116.
X	X	..	X	X	..	..	..	X	X	X	..	..	X	..	..	..	X	X	..	X	X	117.
X	X	X	X	..	..	..	..	..	..	X	..	X	X	..	..	..	..	..	..	X	X	118.
X	X	X	X	X	X	X	..	..	X	..	..	X	X	X	X	..	..	..	..	..	X	119.
X	X	X	X	X	X	X	X	X	..	X	..	X	X	..	X	X	X	X	X	X	X	120.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	121.
X	X	..	..	..	..	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	X	122.
X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	123.
X	X	X	..	X	..	..	..	X	X	..	..	..	..	..	..	..	X	..	X	X	X	124.
..	..	X	X	X	..	..	..	X	X	..	..	X	X	..	X	X	..	X	X	X	X	125.
X	X	X	..	X	..	X	X	X	X	..	..	X	X	X	..	..	..	..	..	..	X	126.
..	..	..	..	..	..	..	X	X	..	X	..	X	..	..	..	..	..	..	X	X	X	127.

TABLE SHOWING THE GEOGRAPHICAL DISTRIBUTION IN THE

	List of Species.	Magheralin. 1	Moira. 2	Kilcorrig. 3	White Mountain. 4	Colin Glen. 5	Black Hill. 6	Wolf Hill. 7	Squire's Hill. 8	Cave Hill. 9	Whitewell. 10	Whiteabbey. 11	Woodburn. 12	Whitehead. 13
128.	Equiangular triradiate spiculum. Pl. II., fig. 6	..	..	..	..	..	..	..	..	..	..	..	..	..
129.	Spiculated equiangular triradiate spiculum. Pl. II., fig. 7	..	x	..	x	x	..	x	x	x	x	..	..	..
130.	Incipiently expanso-ternate spiculum. Pl. II., fig. 8	..	..	..	..	..	x	..	..	..	..	..	x	x
131.	Expando-ternate spiculum. Pl. II., figs. 9 & 10	..	..	..	..	..	x	..	..	x	x	..	..	..
132.	Expando-ternate spiculum, with cylindrical radii. Pl. II., figs. 11 & 12	..	..	..	..	..	..	x	..	x	x	..	x	..
133.	Furcated attenuato-patento-ternate spiculum (constricted). Pl. II., fig. 13	..	..	..	..	..	..	x	..	x	..	..	..	..
134.	Furcated attenuato-patento-ternate spiculum. Pl. II., figs. 14 to 16	..	x	..	x	x	x	x	x	x	x	..	x	..
135.	Furcated attenuato-patento-ternate spiculum. Pl. II., fig. 17	x	x	..	..	x	..	x	x	x	x	..	..	x
136.	Furcated attenuato-patento-ternate spiculum. Pl. II., fig. 18	..	x	x	x	..	x	x	x	x	x	..	..	..
137.	Recurvo-ternate spiculum. Pl. II., fig. 19	..	..	..	..	..	..	x	..	x	x	..	..	..
138.	Spiculum. nov. Pl. III., fig. 1	..	..	..	..	x	..	..	..	x	..	..	..	..
139.	Spiculum. Pl. III., figs. 2 & 3	..	..	..	..	..	..	..	..	x	x	..	..	..
140.	Porrecto-ternate spiculum. Pl. II., fig. 20	x	x	..	..	..	..	..	..	x	..	..	..	..
141.	Porrecto-ternate spiculum. Pl. II., fig. 21	..	..	..	..	..	..	..	..	x	..	..	..	..
142.	Porrecto-ternate spiculum Pl. II., fig. 22	..	..	..	x	..	x	..	x	x	..	..	..	..
143.	Attenuated rectangulate hexradiate spiculum. Pl. III., figs. 4 & 5	x	x	..	..	x	x	x	x	x	..	..	..	..
144.	Skeleton fibres. Pl. III., figs 6 & 7	..	..	..	..	..	..	..	..	..	..	..	..	..
145.	Skeleton fibres. Pl. III., figs. 8 & 9	..	x	..	x	x	..	x	x	x	x	..	x	..
146.	Skeleton fibres. Pl. III., fig. 10	x	..	..	..	..	..	..	..	x	..	..	..	..
	SPONGE SPICULA.													
147.	Sphero-stellate spiculum. Pl. III., fig. 11	..	..	..	..	..	..	..	..	..	..	..	..	..
148.	Recurvo-dentate quaternate spiculum. Pl. II., fig. 23	..	..	..	..	..	..	..	..	..	..	..	..	..
149.	Spiculum ? Plate III., fig. 12	..	..	..	..	..	..	..	..	..	..	..	..	..
150.	Spiculum ? Plate III., fig. 13	..	..	..	..	..	..	..	x	..	..	..	..	..
	FORAMINIFERA.													
151.	Spiroplecta prælonga, (*Reuss*)	..	..	..	..	..	..	..	..	..	..	..	..	..

RTH OF IRELAND OF THE CRETACEOUS MICROZOA—*(Continued).*

	Near Gobbins.	Ballytober.	Near Mill Bay.	Magheramorne.	S. of Ballycarry.	Redhall Glen.	Glenoe.	Waterloo.	Sallagh Braes.	Glenarm.	Carnlough.	Garron Point.	Glenariff.	Lurigethan.	Trostan Mtn.	Torr Head.	Ballintoy.	White Rocks.	N. of Moneymore	Spring Hill.	Slieve Gallion.	Keady Hill.	
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
	..	x	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	x	..	x	..	128.
	x	x	..	x	x	x	..	..	x	x	..	..	x	..	..	x	x	x	x	x	x	x	129.
	x	x	..	..	x	..	x	..	x	..	..	..	x	..	..	x	..	..	..	..	x	..	130.
	x	x	x	..	x	..	x	..	x	x	x	..	x	x	..	x	x	..	x	x	..	x	131.
	x	..	x	..	..	..	..	..	x	..	..	..	..	..	x	..	..	..	..	..	x	..	132.
	..	x	..	..	x	..	..	..	..	x	..	..	..	..	..	x	..	..	..	x	x	..	133.
x	x	x	x	..	x	x	..	x	x	x	..	..	x	..	..	x	x	x	x	x	x	x	134.
	x	x	x	..	x	..	..	..	x	x	x	..	x	x	..	x	x	..	x	x	x	x	135.
x	x	..	..	..	x	..	..	..	..	x	..	..	x	..	x	x	x	x	x	x	x	x	136.
.	x	..	..	..	..	..	..	..	x	..	x	..	x	..	..	..	..	..	..	..	x	..	137.
.	..	x	x	..	x	..	..	..	x	x	..	..	x	..	..	x	..	..	..	..	..	x	138.
.	x	x	x	..	x	..	..	..	x	..	..	..	x	..	..	..	x	x	..	x	x	x	139.
.	x	..	x	..	x	..	..	..	x	..	..	..	x	..	x	x	..	x	..	..	x	..	140.
.	x	x	x	..	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	141.
.	x	x	..	..	x	..	..	..	x	x	x	..	x	..	..	..	..	..	..	x	x	..	142.
x	x	x	x	..	x	..	..	..	x	x	..	..	x	x	x	x	x	x	x	x	x	x	143.
.	..	..	x	..	x	..	..	..	x	..	..	..	x	..	..	..	..	..	..	..	..	..	144.
x	x	x	x	..	x	..	..	x	x	x	x	..	x	..	x	..	x	..	x	x	x	x	145.
.	..	x	x	..	x	..	..	..	x	x	..	..	..	..	..	x	x	..	..	x	x	x	146.
.	..	..	..	..	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	147.
.	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	148.
.	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	149.
.	x	..	x	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	150.
.	..	..	..	..	x	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	151.

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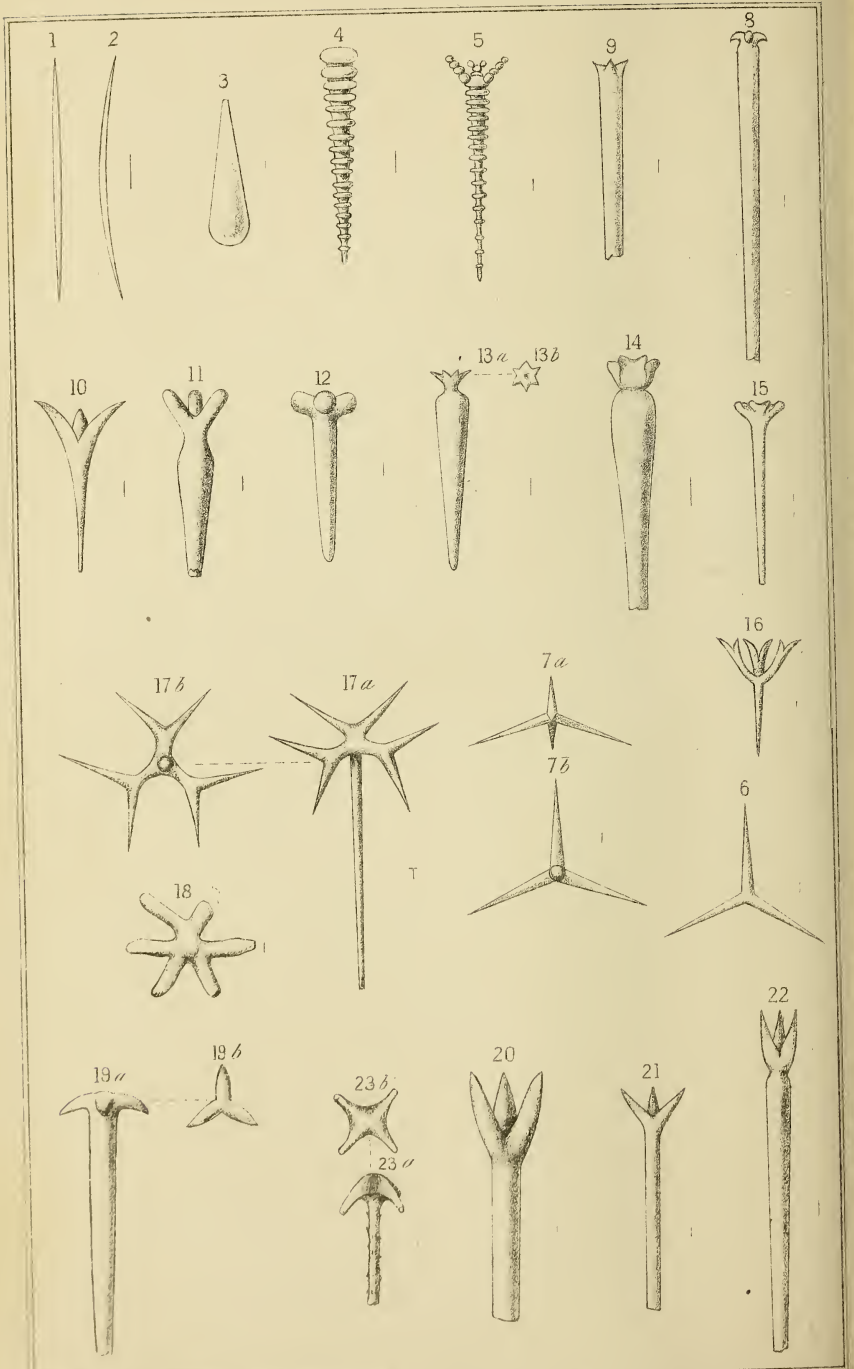


ARCHER & SONS LITH BELFAST

WRIGHT.—IRISH CRETACEOUS MICROZOA.

EXPLANATION OF PLATE II.

[The figures in parentheses refer to the numbers in the List of Species.]

Figs. 1, 2	(124)	*Acerate spicula.* Springhill, Co. Derry.
,, 3	(125)	*Attenuato-acuate spiculum.* Springhill, Co. Derry.
,, 4	(126)	*Moniliform attenuato-acuate spiculum.* Springhill, Co. Derry.
,, 5	(127)	*Furcated porrecto-ternate moniliform spiculum.* Keady Hill, Co. Derry.
,, 6	(128)	*Equiangular triradiate spiculum.* Moira, Co. Down.
,, 7	(129)	*Spiculated equiangular triradiate spiculum.* Moira, Co. Down.
,, 8	(130)	*Incipiently expanso-ternate spiculum.* Glenariff, Co. Antrim.
,, 9	(131)	*Expando-ternate spiculum* (immature). Cave Hill, Co. Antrim.
,, 10	(131)	*Expando-ternate spiculum.* Sallagh Braes, Co. Antrim.
,, 11, 12	(132)	*Expando-ternate spicula, with cylindrical radii.* Sallagh Braes, Co. Antrim.
,, 13	(133)	*Furcated attenuato-patento-ternate spiculum* (constricted). 13 *b. Plane of the radii.* Slieve Gallion, Co. Derry.
,, 14, 15, 16	(134)	*Furcated attenuato-patento-ternate spicula.* Sallagh Braes, Co. Antrim.
,, 17	(135)	*Furcated attenuato-patento-ternate spiculum.* 17 *b. Plan of the radii.* Springhill, Co. Derry.
,, 18	(136)	*Furcated attenuato-patento-ternate spiculum.* Cave Hill, Co. Antrim.
,, 19	(137)	*Recurvo-ternate spiculum.* 19 *b. Plane of the radii.* Sallagh Braes, Co. Antrim.
,, 20	(140)	*Porrecto-ternate spiculum.* Torr Head, Co. Antrim.
,, 21	(141)	*Porrecto-ternate spiculum.* Sallagh Braes, Co. Antrim.
,, 22	(142)	*Porrecto-ternate spiculum.* Sallagh Braes, Co. Antrim.
,, 23	(148)	*Recurvo-dentate quaternate spiculum.* 23 *b. Plane of the radii.* South of Ballycarry Station, Co. Antrim.

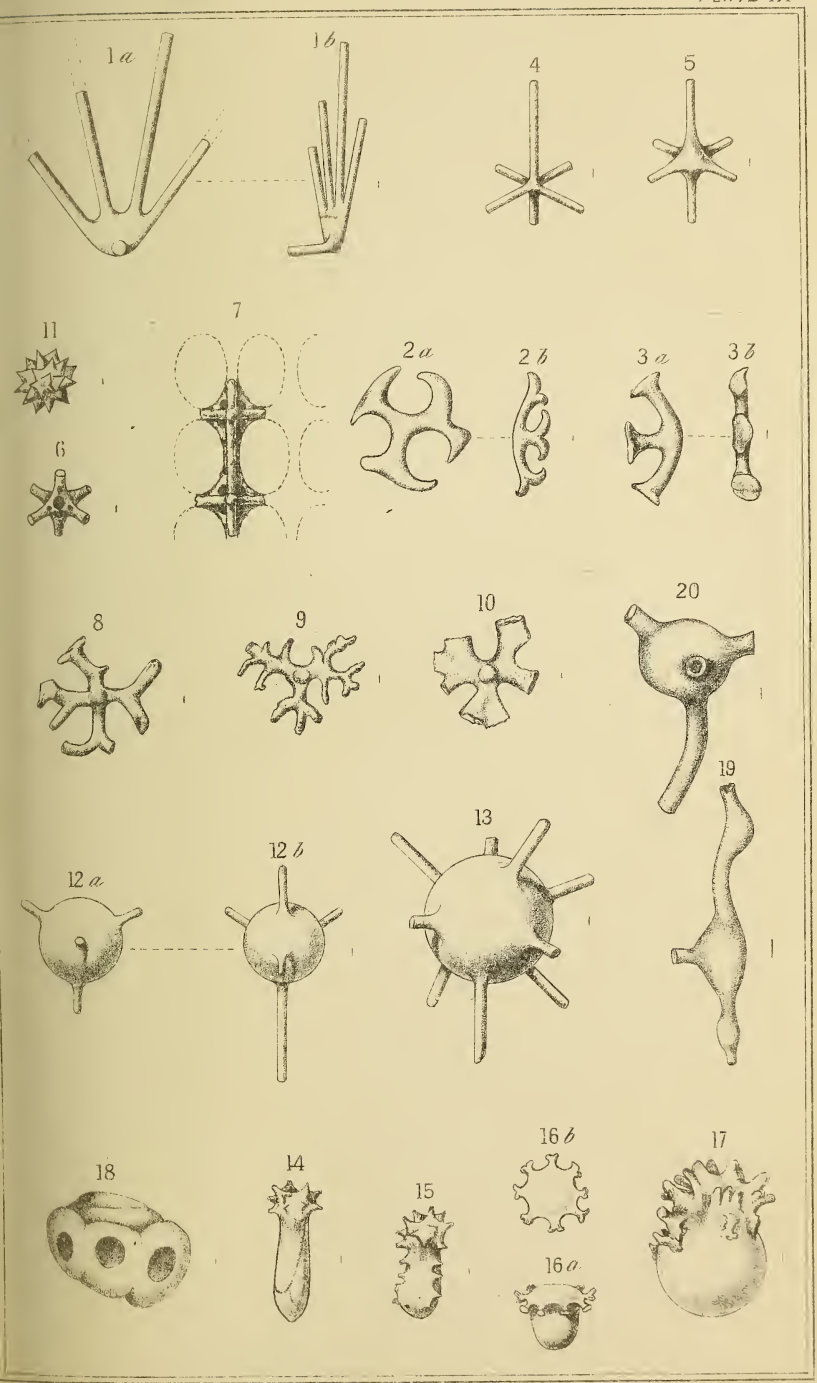
The figures are all enlarged—the line at the side of each indicates the natural size.

EXPLANATION OF PLATE III.

[The figures in parentheses refer to the numbers in the List of Species.]

Fig. 1	(138)	*Spiculum*—new. 1 *b*. *Side view.* Keady Hill, Co. Derry.
,, 2, 3	(139)	*Spicula.* 2 *b*, 3 *b*. *Side views.* Sallagh Braes, Co. Antrim.
,, 4	(143)	*Attenuated-rectangulate hexradiate spiculum.* Springhill, Co. Derry.
,, 5	(143)	*Attenuated-rectangulate hexradiate spiculum.* Ballytober, Co. Antrim.
,, 6	(144)	*Fragment of Skeleton fibre.* Sallagh Braes, Co. Antrim.
,, 7	(144)	*Fragment of Skeleton fibre, same as the preceding one, front view.* South of Ballycarry Station, Co. Antrim.
,, 8	(145)	*Fragment of Skeleton fibre.* Sallagh Braes, Co. Antrim.
,, 9	(145)	*Fragment of Skeleton fibre.* Keady Hill, Co. Derry.
,, 10	(146)	*Fragment of Skeleton fibre.* Ballintry, Co. Antrim.
,, 11	(147)	*Sphero-stellate spiculum.* Sallagh Braes, Co. Antrim.
,, 12	(149)	*Spiculum?* 12 *b*. *Side view.* Ballytober, Co. Antrim.
,, 13	(150)	*Spiculum?* South of Ballycarry Station, Co. Antrim.
,, 14, 15	(82)	*Polymorphina horrida*, Reuss. Near the Gobbins, Co. Antrim.
,, 16	(81)	*Polymorphina damæcornis*, Reuss. 16 *b*. *Upper surface.* South of Ballycarry Station, Co. Antrim.
,, 17	(81)	*Polymorphina damæcornis*, Reuss. Near the Gobbins, Co. Antrim.
,, 18	(121)	*Rotalia* vel *Planorbulina? With each chamber symmetrically perforated.* Black Hill, Co. Antrim.
,, 19	(122)	*Ramulina lævis*, gen. et sp. nov. Jones. Sallagh Braes, Co. Antrim.
,, 20	(123)	*Ramulina brachiata*, sp. nov. Jones. Keady Hill, Co. Derry.

The figures are all enlarged—the line at the side of each indicates the natural size.



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NATURAL HISTORY

As it is intended to issue, from time to time, further Lists of the Fauna, Flora, Fossils, and Antiquities of the North of Ireland, Members are requested to preserve this Appendix for binding with those to be issued in the future.

APPENDIX IV.

RECENT
Foraminifera of Down and Antrim,

BY

JOSEPH WRIGHT, F.G.S.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

CORRELATION

OF THE

SILURIAN ROCKS OF THE CO. DOWN,

BY

WILLIAM SWANSTON, F.G.S.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.,

AND

CHARLES LAPWORTH, F.G.S.

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RECENT FORAMINIFERA OF DOWN AND ANTRIM.

By JOSEPH WRIGHT, F.G.S.

NOTWITHSTANDING the many fine bays and loughs which indent our coast, and the facility thus afforded for studying our recent Foraminifera, the subject has hitherto received but little attention from Irish naturalists. In the year 1858 Prof. Williamson published his Monograph on the recent British Foraminifera (1), and through its pages are frequent references to species found in Ireland. Most of these were collected by the late George C. Hyndman, in Carnlough Bay. The year previous to this a series of dredgings had been taken in Belfast Lough, under the auspices of the British Association; the fine material thus obtained was examined by Prof. Williamson, and yielded 24 species of Foraminifera.

In 1864 a paper was read by Dr. Alcock before the Lit. and Phil. Soc., Manchester, on Natural History Specimens from Connemara. (2.) It included a very instructive and complete list of Foraminifera, numbering no less than 60 species. They were all collected from shore sand, and one locality, viz., Dog's Bay, Roundstone, Connemara. From these three sources we have a list of 65 species, and they comprise all that was known of Irish Foraminifera up to 1875. (3.)

In the autumn of 1875 a number of the Belfast naturalists joined Mr. Thomas Workman, in his yacht Denburn, for the purpose of dredging in Belfast Lough and waters adjacent; and thus commenced a series of dredging

(1.) Recent Foraminifera of Great Britain, 1858.

(2.) Proc. Lit. and Phil. Soc., Manchester, Vol. IV., No. 15. Session 1864-5, p. 192.

(3.) In Thompson's Natural History of Ireland a list of 31 Foraminifera are given, but as in several of these it is uncertain what species were meant, no notice is taken of them in the above estimate.

operations which have been the means of adding considerably to our knowledge of the Foraminifera around our coast. Gatherings have been taken at 29 stations; 7 of these were from Strangford Lough, and the remainder from Belfast Lough and Channel outside; 6 were from between tides, the others were from depths varying from 4 to 72 fms., the greatest depths attained being in the vicinity of the Maiden Lighthouses. Strangford Lough was dredged in company with Mr. S. A. Stewart, F.B.S.E.; the others with Mr. Wm. Swanston, F.G.S., to whose hearty co-operation much of the success attending these excursions is due. Already 110 species have been found, or about 65 per cent. of our British forms. All of these, with the exception of *Lagena striato-punctata*, occur in Belfast Lough and waters outside, and 95 in Strangford Lough.

I have also examined 9 shore gatherings from various places round our N.E. coast; these have been contributed by Mr. Wm. Gray, M.R.I.A. They have been collected with great care from rich foraminiferal sand (see note on table appended). The results of the examination of these gatherings is given in the first nine columns of Table lettered A to I.

Strangford Lough is a fine landlocked bay, 21 miles long by about 5 to 7 miles wide, and connected with the sea by a narrow channel 8 miles long, through which the tides rush in and out furiously. The lough is studded over with innumerable islands and sunken rocks, the depths being very variable, in parts attaining 30 to 35 fms. Its waters abound in marine life, especially starfishes, the dredges frequently coming up quite choked with them. The Foraminifera, though not so numerous in species as in Belfast Lough, are usually of finer proportions, more especially the *Miliolida*, which are unusually large and numerous. At the upper end of the lough the water becomes more or less brackish, as may be inferred from the occurrence of the brackish water forms, *Trochammina inflata*, and *macrescens*, *Quinqueloculina fusca*, and *Polystomella striato-punctata*, in shore gatherings taken at Greyabbey and Newtownards.

Belfast Lough being more convenient for operations than Strangford Lough has been better examined; the water is shallow throughout, but gets gradually deeper as we near its mouth. From White Head on its northern entrance to Orlock Point on its southern side, the greatest depth is 9 to 10 fms., the deepest parts being near the northern shore; and this continues also to be the case outside the lough. Three miles off the Gobbins, a bold headland situated three miles N.E. of White Head, the water attains a depth of 60 to 70 fms., and in the vicinity of the Maiden Lighthouses 70 to 100 fms. Here, however, the bottom is rocky, and yields little or no fine material. The tides all round the coast run with great violence. Too much stress cannot be laid on the necessity

of selecting slack tides for dredging these parts, as otherwise the operations are certain to end in disappointment and failure.

A table is appended of the stations from which the various gatherings were taken, with particulars of bathymetrical range, nature of sea bottom, weight of material brought up, and number of species found. As the quantity of material dredged varied greatly at different stations, it appeared desirable to record the weight collected at each place, so as to arrive at a correct estimate of the relative abundance of foraminiferal life at the various places. (1.)

To my friend Mr. Henry B. Brady, F.R.S., I am deeply indebted for the kind assistance he has rendered me in the critical examination of the doubtful species; and likewise to my friend Mr. William Swanston, F.G.S., for the accurate and artistic drawings in the plate which accompanies this memoir.

The following Foraminifera deserve a passing notice, viz.:—

BILOCULINA RINGENS, (*Lamk.*).

Generally distributed at various depths. A variety of this species is not uncommon in deep water, small in size, and in contour approaching *B. sphœra.*

TRILOCULINA OBLONGA, (*Montagu*).

Very abundant in Strangford Lough, where the specimens are large and typical; in Belfast Lough it is rare, and the specimens usually small.

LITUOLA GLOBIGERINIFORMIS, *P. and J.*

Not unfrequent in Belfast Lough and Strangford Lough; and it also occurs plentifully in Cork Harbour and Kinsale Harbour.

LAGENA SULCATA, *W. and J.*

The costæ on this species are sharply defined, about every alternate one extending up the neck, round which they are usually somewhat twisted.

LAGENA COSTATA, (*Will.*).

This species differs from the last in being entosolenian; in full-grown examples the shell is spherical, with the costæ slightly raised and very regular, extending to near the neck, where they usually end abruptly, the remainder being smooth, as is also the neck, which is short. The texture of the shell is more glassy than in *L. sulcata.* Williamson's figure represents a young speci-

(1.) A very ingenious dredge has been constructed by Mr. David Robertson, F.G.S., of Glasgow. It dips deep into the bottom and fills quickly. It has an advantage over the ordinary dredges in this respect, as each haul brings up a very uniform quantity of the sea bottom. See notes on the recent Foraminifera and Ostracoda of the Firth of Clyde, by David Robertson, F.G.S.—Trans. Geol. Soc. of Glasgow, Vol. V., Part I., p. 112.

men; in this state it has no neck, the shell is thin and sufficiently transparent to show the internal tube.

LAGENA WILLIAMSONI, (*Alcock*).

This form differs from *Lagena costata*, to which it is closely allied, in being smaller in size, less spherical in shape, and the sulci more sharply defined Its chief peculiarity, however, is in the neck, which is short, and formed of two distinct portions—the first directly continuous with the body, and ornamented with two or three rows of hexagonal reticulations; the second a small cylindrical tube, continued from the centre of it. This form is abundant everywhere round our coast, and common in the Estuarine Clay at Magheramorne, County Antrim.

LAGENA STRIATO-PUNCTATA, *P. and J.*

A few examples of this *Lagena* were met with in Strangford Lough; one specimen was also found in Cork Harbour. Abundant in the Estuarine Clay at Magheramorne, County Antrim (1).

LAGENA HISPIDA, *Reuss.*

Ovate, surface covered with numerous blunt spines having a tendency to run into one another in longitudinal rows; a very rare species, only a few examples having been found. It is new to Britain.

LAGENA JEFFREYSII, *Brady.*

Only one example found; transverse section round. Mr. H. B. Brady, F.R.S., informs me "that the species is usually slightly quadrate in transverse contour, but sometimes quite round; is always slightly aculeate; the aculei quite spinous and pointed, very numerous and minute, and the neck commonly with spiral ornamentation. It often has to be washed with hot solution of some alkali to get the encrusting dirt off, as it seems without this a mere rough form that catches dirt."

LAGENA TRIGONO-MARGINATA, *P. and J.*

A three-sided form of *Lagena marginata*. Very rare.

LAGENA OBLONGA, (*Seguenza*).

A three-sided form of *Lagena lucida*. Very rare. A few examples have been found in the Estuarine Clay at Magheramorne, County Antrim.

(1.) I am indebted to my friend Prof. T. Rupert Jones, F.R.S., for his opinion on this *Lagena* and for some of the other Foraminera given in this list.

VAGINULINA LEGUMEN, (*Linn.*).

Large and abundant in the deep water of Strangford Lough.

VAGINULINA LINEARIS, (*Montagu*).

Large and abundant in the deep water in the vicinity of the Maiden Lighthouses.

TINOPORUS LUCIDUS, *Brady MS.*

Generally distributed, but usually occurring in a very fragmentary state. Living specimens were found in the deep water in Strangford Lough, as also in the vicinity of the Maiden Lighthouses. This species is abundant in Dog's Bay, Connemara; it also occurs in Kinsale Harbour, and Cork Harbour. A few examples have been met with in the Estuarine Clay, Magheramorne, County Antrim.

DISCORBINA PARISIENSIS, (*D'Orb.*).

This species has not hitherto been recorded as British. It was first found in shore sand near Greyabbey, Strangford Lough; spire depressed, and exhibiting in fine state the characteristic dotted lines on the inferior surface. It has since been found in abundance in several of the shallow water gatherings in Belfast Lough, the specimens being usually more conical than those from Greyabbey (see figs 2*a*, 2*b*). It has been also found in Kinsale Harbour, and occurs, fossil, in the Estuarine Clay at Magheramorne, County Antrim. Mr. H. B. Brady writes me with reference to this species:—"The specimens of *Discorbina parisiensis* are all very minute, and they vary considerably in contour, some having the thin sharp edge, and low conical figure of D'Orbigny's Models, whilst others are round-edged and thicker; all have the characteristic striation of the inferior surface. The latter variety approximates closely to the characters of *D. obtusa*, and suggests the near relationship of the two forms. It should be observed that *D. parisiensis* has been obtained of the Rev. A. M. Norman, in dredgings from the North Atlantic, whilst *D. obtusa* is not only of frequent occurrence in the Arctic Seas, but has been found on our own shores."

EXPLANATION OF PLATE IV.

Fig. 1. *Discorbina parisiensis*, (D'Orb.). 1 *a*, upper surface; 1 *b*, lower surface; 1 *c*, edge view, x 60, diam.; 1 *d*, fragment of lower surface, showing structure, greatly enlarged. Shore sand, Greyabbey, Strangford Lough, County Down.

,, 2. *Discorbina parisiensis*, (D'Orb.). 2 *a*, upper surface; 2 *b*, lower surface; 2 *c*, edge view; x 60 diam. Off Grey Point, 6 fms.

,, 3. *Trochammina gordialis*, P. and J. x 60 diam. Off Black Head, 20 fms.

,, 4. *Tinoporus lucidus*, Brady MS. 4 *a*, upper surface; 4 *b*, edge view; x 40 diam. White Knowe, Strangford Lough, 6 fms.

,, 5. *Tinoporus lucidus*, Brady MS. Encrusting a stem of polyzoan; x 30 diam. Off Maiden Lighthouses, 60 fms.

,, 6. *Lituola globigeriniformis*, P. and J. x 60 diam. Off Maiden Lighthouses, 60 fms.

,, 7. *Lagena hispida*, Reuss. x 60 diam. Off Black Head, 18 fms.

,, 8. *Lagena trigono-marginata*, P. and J. 8 *a*, side view; 8 *b*, end view showing aperture; x 60 diam. Off White Head, 7 fms.

,, 9. *Lagena oblonga*, (Seguenza). 9 *a*, side view; 9 *b*, end view, showing aperture; x 60 diam. Off White Head, 10 fms.

,, 10. *Lagena sulcata*, W. and J. x 60 diam. Off Black Head, 18 fms.

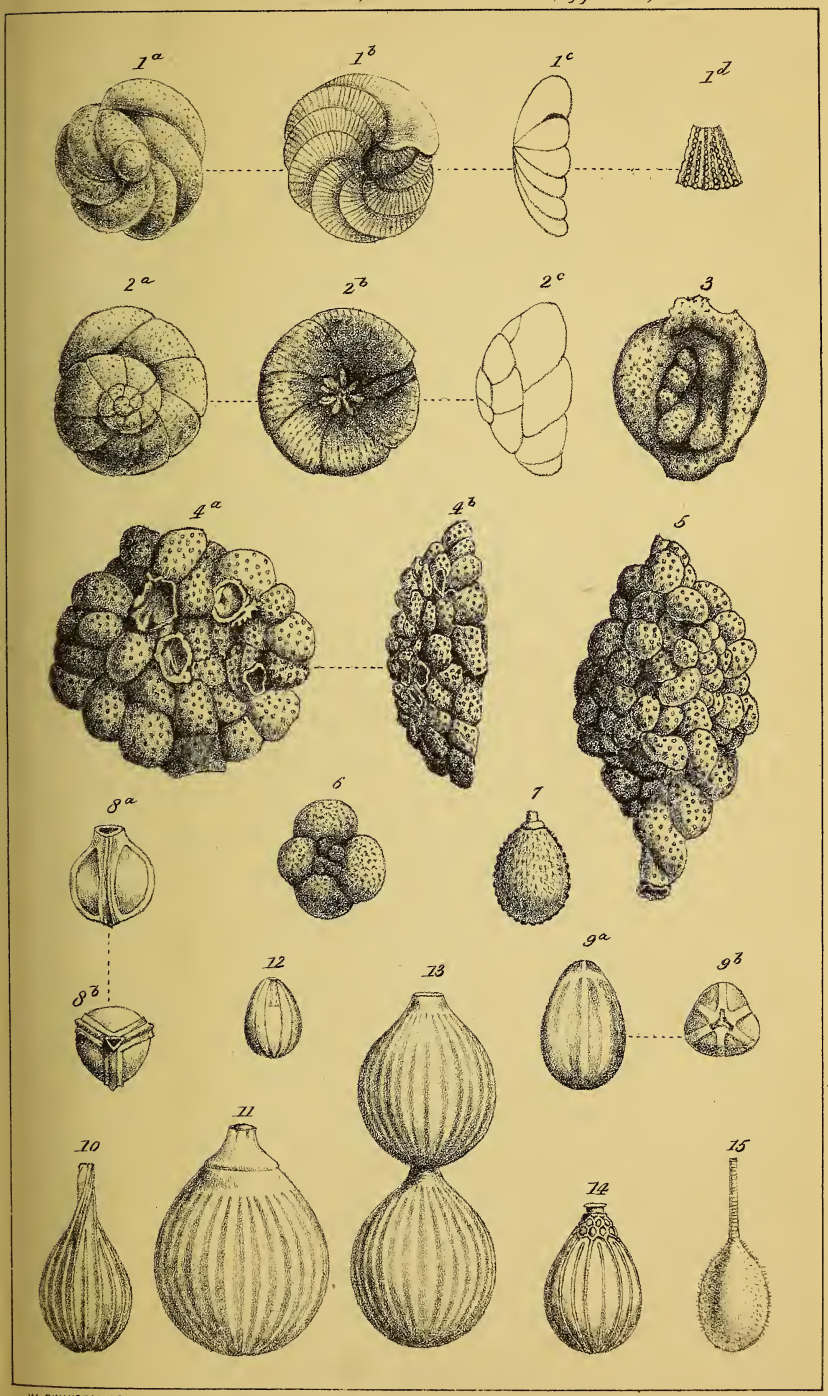
,, 11. *Lagena costata*, (Will.). x 60 diam. Off Black Head, 18 fms.

,, 12. *Lagena costata*, (Will.). A young specimen, x 60 diam. Off Maiden Lighthouses, 60 fms.

,, 13. *Lagena costata*, (Will.). Bilocular, x 60 diam. Off Orlock Point, 11 fms.

,, 14. *Lagena Williamsoni*, (Alcock). x 60 diam. Off White Knowe, Strangford Lough, 6 to 8 fms.

,, 15. *Lagena Jeffreysii*, Brady. x 60 diam. Off Maiden Lighthouses, 62 fms.



W. SWANSTON DEL WRIGHT—FORAMINIFERA OF DOWN AND ANTRIM ARCHER & SONS. LITH

BRITISH MUSEUM

LIST OF LOCALITIES, WITH PARTICULARS OF DEPTH, &c.

	Localities.	Bathymetrical range.	Sea Bottom.	Relative quantities of material examined.	Number of Species from each locality.
A	Downhill beach, Co. Derry, 5 miles N.W. of Coleraine	Between tides	Sand	4 oz	33
B	Carnlough, Co. Antrim, on East, 14 miles N. of Larne	ditto	Sand	9 oz	38
C	Brown's Bay, Islandmagee, Co. Antrim	ditto	Sand	1 lb 1 oz	41
D	Ballyholme Bay, Co. Down, 1 mile E. of Bangor	ditto	Sand	6 oz	31
E	Ballywalter, Co. Down, 7 miles S. of Donaghadee	ditto	Sand	6 oz	27
F	Ballyhalbert, Co. Down, 4 miles S. of Ballywalter	ditto	Sand	4 oz	42
G	Cloghy Bay, Co Down, 5½ miles S. of Ballyhalbert	ditto	Sand	4 oz	18
H	Ballyhornan Bay, Co. Down, 6 miles E. of Downpatrick	ditto	Sand	9 oz	41
I	Tyrella or Dundrum Bay, Co. Down, 6 miles S. of Downpatrick	ditto	Sand	12 oz	36
J	Newcastle beach, Co. Down, between Newcastle and Dundrum	ditto	Sand	4 oz	34
1	Conswater, between Railway Bridges, brackish	ditto	Mud	2 lb 4 oz	12
2	Holywood Bank	ditto	Fine sand	8 lb	36
3	Between Carrickfergus and Kilroot	ditto	Fine sand	8 lb	26
4	Donaghadee	ditto	Fine sand	8 lb	46
5	Off Rockport	4 fms	Sand and dead shells	9 oz	49
6	Off Carrickfergus	5 fms	Coralline	5 oz	66
7	Bangor Bay	4 to 5 fms	Sand and dead shells	9 oz	56
8	Off Bangor Bay	5 fms	Sand and dead shells	3 lb 8 oz	46
9	Off Grey Point—Mid-channel	6 fms	Muddy sand and dead shells	3 lb	76
10	Off White Head	6 to 7 fms	Coralline and mud—two gatherings	2 lb	66
11	Off White Head	10 fms	Sand and dead shells	3 lb	80
12	Off Orlock Point	11 fms	Sand	8 lb	89
13	Off Black Head	15 to 18 fms	Mud, sand, shells, Polyzoa—six gatherings	6 lb 5 oz	92
14	Off Black Head	20 fms	Sand	22 lb	91
15	¼ Mile off Coalpit Bay	13 fms	Sponges	7 oz	67
16	2 Miles N.W. of Copeland Island	14 fms	Sand and shells	1 lb 9 oz	78
17	2 Miles N.E. of Larne	22 fms	Dead shells	1 oz	21
18	2½ Miles N.E. of Donaghadee	25 fms	Sand and dead shells	1 lb 2 oz	38
19	2 Miles N.E. of Muck Island	50 fms	Stones and shells	4 oz	30
20	2 Miles S. of Maiden Lighthouses	60 fms	Sand	8 lb	85
21	3 Miles S.S.E. of Maiden Lighthouses	62 fms	Sand	5 lb 13 oz	77
22	2 Miles S.S.E. of Maiden Lighthouses	72 fms	Sand and Zoophytes—several gatherings	11 oz	68
23	Near Newtownards, Strangford Lough, brackish	Between tides	Sand	6 lb	6
24	Near Greyabbey, Strangford Lough, slightly brackish	ditto	Sand	3 lb 12 oz	23
25	Off White Knowe, Strangford Lough	6 to 8 fms	Mud and sand	8 lb	85
26	Off Chapel Island, Strangford Lough	8 to 10 fms	Sand	2 lb 8 oz	73
27	Off Bar Rock, Strangford Lough	10 to 15 fms	Sand and shells	2 lb 12 oz	54
28	Off Dononeill, Strangford Lough	12 fms	Sand and shells	2 lb	77
29	Off Marlpool, Strangford Lough	20 to 25 fms	Sand	5 lb	52

NOTE.—The first nine gatherings, lettered A to I, have been sent me by Mr. Wm. Gray, M.R.I.A., accompanied with a note giving the following particulars:—"Herewith I send you nine samples Foraminiferal sand. All the samples were collected off the surface of the beach sand, along the fringes of the wave lines left by the receding tide. In some cases I was able to take a cleaner gathering of the organic remains than in others. However, I would not place any value on the relative proportions of sand and organic remains from the respective stations, as the proportion must vary with the condition, time, season, and weather under which the several gatherings were made."

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TABLE SHEWING THE DISTRIBUTION OF FORAMINIFERA IN THE COUNTIES OF DOWN AND ANTRIM.

ABBREVIATIONS:—v. r., very rare; r., rare; c., common; v. c., very common. Species marked * are new to the British Fauna. Figures in column marked † refer to Plate (IV) accompanying this paper.

	LIST OF SPECIES.	Reference to Plate IV.	BETWEEN TIDES.															BELFAST LOUGH.														IRISH CHANNEL.										STRANGFORD LOUGH.							
		†	A	B	C	D	E	F	G	H	I	J	1	2	3	4	5	6	7	8	9	10	10a	11	12	13	14	15	16	17	18	19	20	21	21a	22	23	24	25	26	27	28	29	
			Dowhill.	Cairnlough.	Brown's Bay, Islandmagee.	Ballyholme Bay.	Ballywalter.	Ballyhalbert.	Ballyhornan.	Clogher Bay.	Tyrella.	Newcastle.	Connswater (brackish).	Holywood Bank.	Between Carrickfergus and Kilroot.	Donaghadee.	Off Rockport, 4 fms.	Off Carrickfergus, 5 fms.	Bangor Bay, 4 to 5 fms.	Off Bangor Bay, 5 fms.	Off Grey Point, 6 fms.	Off White Head, 6 to 7 fms.	Off White Head, 8 fms.	Off White Head, 10 fms.	Off Orlock Point, 11 fms.	Off Black Head, 15 to 18 fms.	Off Black Head, 20 fms.	Off Coalpit Bay, 13 fms.	Off Copeland Island, 14 fms.	Off Larne, 22 fms.	Off Donaghadee, 25 fms.	Off Muck Island, 50 fms.	Off Maiden Lighthouses, 60 fms.	Off Maiden Lighthouses, 62 fms.	Off Gobbins, 60 to 65 fms.	Off Maiden Lighthouses, 72 fms.	Near Newtownards (brackish), Between tides.	Greyabbey (slightly brackish), Between tides.	Off White Knowe, 6 to 8 fms.	Off Chapel Island, 8 to 10 fms.	Off Bar Rock, 10 to 15 fms.	Off Donaghadee, 12 fms.	Off Marlpool, 20 to 25 fms.	
	SUBORDER IMPERFORATA.																																																	
	FAMILY MILIOLIDA.																																																	
	CORNUSPIRA, *Schultze.*																																																	
1	foliacea, (*Phil.*), 1844. Orbis foliaceus, Enum. Moll. Sicil. Vol. II., p. 147, pl. 24, fig. 26	..	...	r	r	...	...	r	...	r	...	...	...	r	r		r	c	r	r	r	r	r	c	r	c	r	c	c	r	...	r	r	r	r	...	r	c	c	r	vc	r	1
	BILOCULINA, *D'Orb.*																																																	
2	ringens, (*Lamk.*), 1804, Miliolites ringens, Ann. Mus., Vol. V., p. 351; Vol. IX., pl. 17, fig. 1	...	r	r	r	..	...	...	...	...	r	...	...	...	..	r	...	r	r	...	c	r	c	r	c	c	c	r	c	r	c	.	r	c	r	r	...	...	r	r	r	r	r	2
3	depressa, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 298, No. 1; Modèle, No. 91	..	c	c	c	r	r	r	...	vr	r	vr	...	...	...	r	r	r	r	...	c	...	r	r	c	c	vc	c	c	r	c	r	r	r	c	c	...	...	vc	c	vc	c	vc	3
4	elongata, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 298, No. 1	...	...	..	r	vr	...	r	...	...	...	...	...	...	...	...	...	r	...	...	r	r	r	r	r	r	c	...	c	...	r	...	r	r	r	c	...	...	r	r	...	r	r	4
	TRILOCULINA, *D'Orb.*																																																	
5	trigonula, (*Lamk.*), 1804, Miliolites trigonula, Ann. Mus., Vol. V., p. 351, No. 3	...	.	...	r	...	..	..	...	...	...	...	...	..	..	r	...	c	r	...	c	c	c	c	c	c	r	c	r	c	r	r	r	c	r	..	...	c	c	c	c	c	5
6	tricarinata, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 299, No. 7; Modèle, No. 94	...	...	...	...	...	...	...	...	...	...	...	...	...	...	r	...	r	...	...	r	r	r	c	r	r	c	...	c	...	..	...	vr	c	...	r	...	c	r	...	r	r	6
7	oblonga, (*Montagu*), 1803, Vermiculum oblongum, Test. Brit., p. 522, pl. 14, fig. 9	...	...	r	c	c	c	...	r	...	c	c	c	...	r	r	r	..	...	...	r	...	r	r	r	r	c	r	r	r	...	...	r	r	...	r	...	vc	vc	vc	vc	vc	vc	7
8	Brongniartii, *D'Orb.*, 1840 Foram. Cuba, p. 156, pl. 10, figs. 6-8	...	..	vr	vr	...	...	...	...	...	...	...	...	...	...	r	r	c	r	r	c	c	r	r	c	r	r	c	r	..	r	...	r	r	vr	r	..	...	c	c	c	c	c	8
	QUINQUELOCULINA, *D'Orb.*																																																	
9	seminulum, (*Linné*), 1767, Serpula seminulum, Syst. Nat., 12th ed., p. 1264, No. 791	...	c	vc	vc	vc	vc	vc	c	vc	vc	vc	...	r	c	c	r	c	c	c	c	c	c	c	vc	c	c	c	c	c	c	c	vc	r	c	c	..	...	vc	vc	vc	vc	vc	9
10	subrotunda, (*Montagu*), 1803, Vermiculum subrotundum, Test. Brit., p. 521	...	vc	vc	vc	vc	c	vc	c	vc	vc	vc	...	r	...	c	r	r	r	c	c	r	vc	vc	vc	vc	vc	c	vc	c	c	r	vc	vc	c	r	r	c	vc	vc	c	c	c	10
11	secans, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 303, No. 43; Modèle, No. 96	...	..	c	vc	...	r	c	vc	c	vc	c	...	c	c	vc	...	r	.	..	r	...	vr	vr	r	vr	r	r	..	...	...	...	...	...	...	...	...	...	r	c	vc	c	vc	11
12	bicornis, *W. and J.*, 1798. Serpula bicornis (fide Kanmacher), Adams' Essays on the Microscope, 2nd ed., p. 633, pl. 14, fig. 2	...	r	r	r	c	..	...	r	...	...	...	...	...	...	r	r	r	...	...	...	r	r	r	r	r	r	c	c	...	...	r	r	r	c	r	...	...	r	c	c	r	c	12
13	Ferussacii, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 301, No. 18; Modèle, No. 32	...	vr	...	...	...	..	...	...	...	...	...	...	...	...	...	..	...	...	...	vr	...	vr	vr	...	vr	r	...	r	...	...	...	r	...	r	...	...	...	r	...	r	r	13
14	pulchella, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 303, No. 42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	...	r	r	...	...	...	c	r	...	c	r	...	...	...	vr	...	...	...	...	...	c	r	...	r	c	14
15	fusca, *Brady*, 1870, Ann. and Mag. Nat. Hist., Ser. 4, Vol. VI., p. 47, pl. 11, fig. 2	...	...	...	...	...	...	...	...	vr	...	..	vc	vr	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	r	c	...	...	...	...	15
16	agglutinans, *D'Orb.*, 1840, Foram. Cuba, p. 168, pl. 12, figs. 11-13	...	r	c	r	c	c	c	r	vc	c	r	...	vc	c	vc	c	c	c	...	...	c	...	r	c	r	r	...	r	...	...	...	vr	...	...	r	...	c	c	c	...	c	r	16
	SPIROLOCULINA, *D'Orb.*																																																	
17	limbata, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 299, No. 12	...	r	r	r	vr	r	r	r	r	r	r	...	...	...	...	...	r	...	...	r	r	c	r	c	c	c	c	...	r	...	r	c	c	c	c	...	...	r	r	c	c	vc	17
18	planulata, (*Lamk.*), 1805, Miliolites planulata, Ann. Mus., Vol. V., p. 352, No. 4	...	...	...	...	...	..	...	...	vr	...	...	...	...	...	...	...	...	...	...	r	r	...	...	r	...	r	...	...	...	...	..	r	...	...	...	...	...	r	r	r	r	vc	18
19	canaliculata, *D'Orb.*, 1846, For. Foss. Vienne, p. 269, pl. 16, figs. 10-12	...	vr	...	...	...	vr	...	...	...	...	vr	...	...	...	...	r	r	r	r	c	c	r	r	vc	c	r	c	c	...	...	..	r	...	...	r	...	...	c	c	r	c	r	19
	FAMILY LITUOLIDA.																																																	
	TROCHAMMINA, *P. and J.*																																																	
20	squamata, *P. and J.*, 1860, Quart. Jour. Geol. Soc., Vol. XVI., p. 304, No. 88	...	...	...	...	..	...	..	..	..	...	...	r	c	...	...	vr	...	r	r	r	r	c	r	r	vr	r	r	r	r	...	r	r	vr	r	...	...	c	c	r	c	r	20
21	gordialis, *P. and J.*, 1860, Quart. Jour. Geol. Soc., Vol. XVI., p. 304, No. 88	Fig. 3	..	...	...	...	...	...	.	vr	..	..	...	...	...	...	...	...	...	...	...	...	vr	...	..	vr	r	vr	vr	...	...	vr	r	vr	r	...	r	r	vr	...	c	...	21
22	incerta, (*D'Orb.*), 1839, Operculina incerta, Foram. Cuba, p. 49, pl. 6, figs. 16-17	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	vr	r	r	r	r	...	r	...	r	r	vr	r	...	...	vr	...	vr	vr	..	22
23	inflata, (*Montagu*), 1808, Suppl. Test. Brit., p. 81, pl. 18, fig. 3	...	...	...	...	..	...	..	...	...	...	...	vc	vr	...	...	...	...	...	...	...	...	...	..	...	...	...	...	vr	...	...	...	...	...	...	...	r	r	..	...	...	...	23
24	macrescens, *Brady*, 1870, Ann. and Mag. Nat. His., Ser. 4, Vol. VI., p. 290, pl. 11, figs. 5. *a-c*	...	...	...	...	...	...	...	...	...	...	...	c	..	...	...	...	...	...	...	...	...	...	...	...	—	...	...	...	..	...	...	...	...	...	...	r	r	...	...	...	...	24
	LITUOLA, *Lamk.*																																																	
25	fusiformis, (*Will.*), 1858, Proteonina fusiformis, Rec. For. Gr. Br., p. 1, pl. 1, fig. 1	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	..	vr	vr	vr	...	vr	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	25
26	nautiloidea, *Lamk.*, 1804, Ann. Mus., Vol. V., p. 243, No. 1	...	...	...	..	...	...	...	...	...	.1	...	...	...	...	...	...	r	...	...	c	c	r	r	r	c	r	c	c	...	...	r	r	...	...	vr	...	...	vc	c	r	c	r	26
27	scorpiurus, (*Montfort*), 1808, Reophax scorpiurus, Conchyl. Syst., Vol. 1, p. 330, 830 genre	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	...	...	...	...	...	..	...	vr	...	...	...	...	...	vr	vr	...	..	...	...	...	...	...	...	...	27
28	canariensis, *D'Orb.*, 1839, Nonionina canariensis, Nat. Hist. Canaries, p. 128, pl. 2, figs. 33, 34	...	c	c	c	...	...	...	...	c	c	r	...	r	r	r	r	r	r	c	r	r	c	c	r	c	c	r	c	c	r	c	r	c	c	c	...	...	c	c	c	c	r	28
29	globigeriniformis, *P. and J.*, 1865, Phil. Trans., Vol. CLV., p. 407, pl. 15, figs. 46, 47, and pl. 17, figs. 96—98	Fig. 6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	r	...	...	...	...	c	c	r	vr	c	r	c	...	...	...	c	c	c	c	...	...	...	r	...	r	...	29
	SUBORDER PERFORATA.																																																	
	FAMILY LAGENIDA.																																																	
	LAGENA, *W. and J.*																																																	
30	sulcata, *W. and J.*, 1794 (fide Kanmacher), Adams' Essays on the Microscope, 2nd ed., p. 634, pl. 14, fig. 5	Fig. 10	r	...	c	c	c	r	...	c	r	...	...	...	..	r	...	r	r	r	r	...	r	c	c	c	vc	r	c	r	r	...	c	c	c	c	..	...	r	r	..	r	r	30
31	costata, (*Will.*), 1858, Entosolenia costata, Rec. For. Gr. Br. p. 9, pl. 1, fig. 18	,, 11,12,13	r	vc	vc	c	c	r	...	r	r	r	...	.	r	r	r	...	r	...	...	...	r	r	c	c	r	...	r	..	vc	...	r	c	c	c	...	...	c	r	r	r	vc	31
32	Williamsoni, (*Alcock*), 1864, Entosolenia Williamsoni, Proc. Manchester Lit. and Phil. Soc., Vol. IV., No. 15	,, 14	c	r	c	vc	c	vc	r	vc	c	c	...	r	c	c	r	...	r	c	c	c	vc	c	c	c	vc	c	c	...	c	...	c	c	vc	c	...	...	c	r	r	r	c	32
33	Lyellii, (*Seguenza*), 1862, Amphorina Lyellii, Foram. Monotal. Mioc. Messin., p. 52, pl. 1, fig. 40	...	...	.	...	...	...	...	...	...	...	...	...	...	..	...	...	vr	...	...	...	vr	r	vr	vr	vr	vr	...	vr	...	...	...	...	...	...	...	...	...	r	r	...	...	...	33
34	lævis, (*Montagu*), 1803, Vermiculum lævæ, Testacea Britannica, p. 524	...	...	r	c	vr	...	r	...	r	r	vr	...	r	c	r	r	c	r	c	c	vc	vc	c	c	c	c	r	c	...	c	r	c	c	c	c	...	vr	c	c	c	c	vc	r	34
35	distoma, *P. and J.*, 1864, Phil. Trans., Vol. CLV., p. 356, pl. 13, fig. 20	...	...	...	...	...	...	...	.	..	...	...	...	r	...	...	r	vr	r	c	r	r	r	...	r	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	...	...	vr	...	35
36	gracillima, (*Seguenza*), 1862, Amphorina gracillima, Foram. Monotal. Mioc. Messin., p. 51, pl. 1., fig. 35.	...	...	...	...	...	...	...	...	vr	...	...	...	r	...	...	r	r	...	r	r	r	c	r	v	...	r	r	r	...	...	...	r	r	vr	...	...	...	r	r	...	r	...	36
37	globosa, (*Montagu*), 1803, Vermiculum globosum Testacea Britannica, p. 513	...	r	vr	r	r	...	r	...	c	r	r	...	...	...	r	...	r	...	r	r	r	r	r	r	c	r	r	r	...	...	r	c	...	...	...	...	...	r	r	...	r	...	37
38	striata, (*D'Orb.*), 1839, Oolina striata, Voy l'Amér. Mérid., p. 21, pl. 5, fig. 12	...	..	vr	..	...	...	...	...	...	.	...	...	r	...	r	r	r	r	c	c	r	vc	c	c	r	r	r	r	...	...	...	vr	r	...	r	...	...	c	r	...	c	...	38
39	striato-punctata, *P. and J.*, 1865, Phil. Trans., Vol. CLV., p 350, pl. 13, figs. 25—27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	vr	vr	vr	...	39
40	semistriata, *Will.*, 1848, Ann. & Mag. Nat. Hist., ser. 2, Vol. I., p. 14, pl. 1, figs. 9, 10	...	vr	...	r	r	...	r	...	vr	r	vr	...	r	r	r	r	r	r	c	c	r	c	c	r	r	r	...	r	...	...	...	r	r	vr	r	...	...	c	r	...	c	...	40
41	*hispida, *Reuss*, 1863, Sitzungsb. Ak. Wiss. Wien., Vol. XLVI., p. 335, pl. 6, figs. 77—79	Fig. 7	...	..	...	...	...	vr	..	...	...	..	...	..	...	...	...	...	vr	...	...	...	vr	...	...	vr	vr	...	...	...	...	...	...	vr	...	...	...	...	vr	...	...	...	...	41
42	Jeffreysii, *Brady*, 1866, Report Brit Ass. (Nottingham Meeting) Trans. Sections, p. 70	,, 15	..	.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	...	...	...	...	...	...	...	...	...	...	...	...	vr	...	...	...	...	...	...	...	42
43	caudata, *D'Orb.*, 1839, Voy. l'Amér. Mérid., Vol V., part 5, p. 19, pl. 5, fig. 6	...	...	...	c	c	...	vr	...	vr	...	..	...	...	r	r	r	r	r	r	c	c	c	r	c	r	c	r	c	...	r	...	r	c	c	c	...	...	c	r	...	r	r	43
44	marginata, *W. and J.*, 1784, Serpula (Lagena) marginata, Test. Min., p. 3, pl. 1, fig. 7	Fig. 8 a b	c	r	r	r	...	c	...	c	vr	vr	vr	r	r	c	r	r	r	c	c	r	vc	vc	c	c	vc	r	vc	...	r	r	c	vc	vc	r	...	vr	c	vc	r	r	.	44
45	trigono-marginata, *P. and J.*, 1865, Phil. Trans., Vol CLV., p 352, pl. 18, fig. 1	...	...	...	...	...	...	...	...	..	...	..	...	...	...	...	...	...	...	...	..	vr	vr	...	vr	vr	vr	...	r	...	...	...	...	...	...	...	...	vr	vr	..	...	vr	vr	45
46	pulchella, *Brady*, 1866 Report Brit. Ass. (Trans. Sections), p. 70	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	46
47	ornata, (*Will.*), 1858, Entosolenia marginata, var. ornata, Rec. For. Gr. Br., p. 11, pl. 1, fig. 24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	c	r	r	vr	r	vr	r	vr	...	..	...	.	vr	r	...	...	...	...	vr	r	...	vr	r	47
48	lucida, (*Will.*), 1858, Entosolenia marginata, var. lucida, Rec. For. Gr. Br., p 10, pl. 1, figs. 22. 23	...	...	r	r	c	r	c	...	c	r	r	...	r	r	c	r	r	r	c	c	c	r	vc	c	r	c	r	r	...	r	...	r	r	r	...	...	...	vc	c	r	c	r	48
49	*oblonga, (*Seguenza*), 1862, Trigonulina oblonga, Foram. Monotal. Messin., pt. 2, p. 75, pl. 2, figs. 56—58	Fig. 9 a b	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	vr	...	vc	r	r	...	...	..	...	...	...	...	c	...	...	...	...	...	vr	...	...	...	...	49
50	melo, (*D'Orb.*), 1847, Oolina melo, Voyage dans l'Amer. Mérid., Vol. V., pt. 5, p. 20, pl. 5, fig. 9	...	..	r	r	c	...	c	...	vc	r	r	...	r	r	r	r	r	r	c	r	r	c	vc	c	c	c	r	vc	...	r	..	r	c	c	c	...	...	vc	c	r	c	r	50
51	squamosa, (*Montagu*), 1803, Vermiculum squamosum, Test. Brit., p. 526, pl. 14, fig. 2	...	.	r	r	r	vr	r	vr	r	...	...	...	r	r	r	r	r	r	vr	r	r	c	c	c	r	c	r	c	r	r	...	r	c	...	...	...	...	c	r	r	c	...	51
	NODOSARIA, *Lamk.*																																																	
52	raphanus, (*Linné*), 1758, Nautilus raphanus, Syst. Nat., 10th ed. p. 711, No. 243; 1767, Syst. Nat., 12th ed., p. 1164, No. 283	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	52
53	scalaris, (*Batsch*), 1791, Nautilus (Orthoceras) scalaris, Conchyl. Seesands, pl. 2, figs. 4a, b	...	...	vr	vr	...	...	...	..	vr	...	...	...	...	r	r	...	r	r	r	c	r	c	r	r	vr	r	...	c	...	...	...	r	r	...	...	...	...	r	r	...	r	...	53
54	pyrula, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 253, No. 13; Soldani Testac., Vol. II., pl. 10, figs. b, c	...	...	...	vr	...	...	...	...	...	...	...	...	...	...	...	...	...	...	r	r	r	r	r	r	r	r	r	...	...	...	...	r	r	...	...	...	...	c	...	...	r	...	54
	DENTALINA, *D'Orb.*																																																	
55	communis, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 254, No. 35	..	...	...	vr	..	...	...	...	...	...	...	...	...	...	...	r	r	r	...	r	r	c	r	r	r	r	r	r	...	...	.	r	r	...	vr	...	..	.	r	...	r	...	55
56	guttifera, *D'Orb.*, 1846, For. Foss. Vienne, p. 49, pl. 2, figs. 11—13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	r	...	..	..	c	r	r	vr	r	...	r	...	r	r	...	..	...	...	...	...	r	...	...	r	...	56
57	obliqua, (*Linné*), 1767, Nautilus obliquus, Syst. Nat., 12th ed., p. 1165, No. 281	...	...	..	..	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	vr	..	vr	...	...	r	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	57
58	obliquestriata, *Reuss*, 1851, Zeitsch. deutsch geol. Gesell., Vol. III., p. 63, pl. 3, figs. 11, 12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	vr	...	r	...	...	r	r	...	r	...	...	...	...	...	...	...	...	58
	VAGINULINA, *D'Orb.*																																																	
59	legumen, (*Linné*), 1758, Nautilus legumen, Syst. Nat., 12th ed., p. 1162	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	r	...	r	...	...	vr	...	r	r	...	...	r	r	r	vr	r	...	...	r	r	c	...	c	59
60	linearis, (*Montagu*), 1808, Nautilus linearis, Test. Brit., Supplement, p. 82, t. 19, fig. 6	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	r	vr	...	r	..	...	r	r	c	r	...	r	...	..	..	...	...	...	...	60
	CRISTELLARIA, *Lamk.*																																																	
61	rotulata, (*Lamk.*), 1804, Lenticulites rotulata, Annales du Museum, Vol. V., p. 188, No. 3	...	vr	...	...	...	...	vr	...	vr	.	...	...	...	...	r	...	r	r	..	r	r	c	r	r	c	r	c	r	r	r	r	r	...	r	...	...	...	r	r	c	...	r	61
62	crepidula, (*F. and M.*), 1803, Nautilus crepidula, Testacea Microscopica, p. 107, pl. 19, figs. g, i	...	r	vr	...	...	...	r	...	...	..	r	...	..	...	r	..	r	...	...	r	r	r	r	r	r	c	r	r	...	r	r	vr	...	...	...	...	c	r	r	r	r	62
	POLYMORPHINA *D'Orb.*																																																	
63	lactea, (*W. and J.*), 1798, Serpula lactea (fide Kanmacher), Adams' Essays, 2nd ed., p. 634, pl. 24, fig. 4	...	...	..	r	...	...	...	...	...	r	...	...	vr	...	r	...	...	...	...	r	r	r	r	r	c	c	r	c	vc	vc	r	r	c	vc	vc	...	vr	r	c	r	...	vr	63
64	gibba, (*D'Orb.*), 1846, Globulina gibba, For. Foss. Vienne, pl. 13, figs. 13, 14	...	c	c	c	c	c	c	r	c	vc	c	...	...	...	c	r	r	r	...	r	...	c	r	r	r	c	c	c	...	c	r	r	c	c	r	...	...	c	c	r	r	vc	64
65	oblonga, (*Will.*, 1858, Rec. For. Gr. Br., p. 71, pl. 6, figs. 149, 149a	...	...	...	...	...	...	vr	...	...	...	...	...	...	...	...	...	...	...	...	r	...	r	r	...	r	c	vr	r	...	r	...	r	r	...	r	...	...	r	...	...	...	...	65
66	compressa, *D'Orb.*, 1846, For. Foss. Vienne, p. 243, pl 12, figs. 32—34	...	r	c	r	r	r	...	...	...	vc	c	...	...	...	r	r	...	...	...	...	r	c	r	r	r	c	r	c	...	r	...	r	r	r	r	...	...	...	...	r	r	r	...	66
67	concava, *Will.*, 1858, Rec. For. Gr. Br., p 72, pl. 6, figs. 151, 152	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	vr	...	...	...	vr	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	67
68	Orbignii, (*Zborzewski*), 1834, Nouv. Mem. Soc. Imp. Nat. Moscow, Vol. III., p. 311, pl. 28, fig. 2b	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	..	..	vr	..	...	...	...	...	...	vr	r	...	r	...	...	...	r	c	...	vr	68
69	myristiformis, *Will.*, 1858, Rec. For. Gr. Br., p. 73, pl. 6, figs. 156, 157	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	v	vr	...	r	...	...	...	...	...	..	...	vr	..	...	...	...	...	...	...	...	...	69
	UVIGERINA, *D'Orb.*																																																	
70	angulosa, *Will.*, 1858, Rec. For. Gr. Br., p. 67, pl. 5, fig. 140	...	..	...	...	vr	...	...	...	...	...	...	...	r	...	...	r	r	r	c	r	c	r	r	r	r	r	r	...	...	...	...	r	r	...	r	...	...	r	...	r	r	r	70
	FAMILY GLOBIGERINIDA.																																																	
	SPIRILLINA, *Ehren.*																																																	
71	vivipara, *Ehren.*, 1841, Verbreitung, &c., p. 442, pl. 3, fig. 441	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	r	r	r	r	r	r	r	r	r	...	...	...	r	vr	r	...	...	..	r	...	r	r	c	r	71
	ORBULINA, *D'Orb.*																																																	
72	universa, *D'Orb.*, 1839, Foram. Cuba, p. 3, No. 1, pl. 1, fig. 1	...	..	...	...	vr	...	..	...	...	c	c	...	r	...	...	vr	...	vr	...	r	vr	r	r	vr	r	r	...	vr	...	...	...	r	r	...	r	...	...	...	r	r	r	vr	...	72
	GLOBIGERINA, *D'Orb.*																																																	
73	bulloides, *D'Orb.*, 1826, Ann. Sci. Nat., Vol. VII., p. 277, No. 1—Modèles Nos. 17 & 76	...	c	r	c	c	c	vc	...	c	...	...	vr	r	r	c	r	r	r	c	c	c	vc	vc	vc	vc	vc	c	vc	...	c	r	vc	vc	c	c	...	r	c	c	r	c	r	73
	TEXTULARIA, *Defrance.*																																																	
74	sagittula, *Defrance*, 1824, Dict. des Sci. Nat., Vol. XXXII., p. 177; Vol. LIII., p 344; Atlas Conch., pl. 13, fig. 5.—Blainville, Malacologie, p. 370, pl. 5, fig. 5	...	vc	r	r	...	r	c	...	...	...	...	...	...	...	r	...	c	...	...	c	r	c	r	c	vc	vc	c	c	r	c	r	vc	c	c	c	...	...	r	c	c	r	r	74
75	agglutinans, *D'Orb.*, 1840, Foram. Cuba, p. 136, pl. 1, figs. 17, 18, 32—34	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

BRITISH MUSEUM

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ON THE SILURIAN ROCKS OF THE COUNTY DOWN.

Part I.—Correlation.

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INTRODUCTION.

In a paper which I had the honour of reading before the Club in March, 1875, I endeavoured to give some particulars of a series of fossils which I had obtained from the Silurian rocks of the County Down. At that time I had succeeded in procuring them from only one locality—Coalpit Bay, near Donaghadee,—and the results did not exceed fifteen species. Further research in the same locality, and a more extended examination of the district, have been rewarded by a large addition to the list, affording better evidence than has hitherto been available for determining the geological position of the rocks in which they are found.

The Silurian rocks of County Down form part of an area which is rudely triangular in form. A line drawn from Grey Point on the shore of Belfast Lough in a south-westerly direction through Holywood, along the valley of the Lagan, by Lisburn and Waringstown, would mark its north-western boundary. The Irish Sea bounds it on the east, and to the south the Carboniferous limestone forms the base of the figure by an irregular line running westward from Drogheda. It comprises the greater parts of the Counties of Down, Armagh, Monaghan, Louth, Meath, and Cavan. The district is an agricultural one, its surface of an undulating or hillocky character, possessing few elevations deserving the title of mountains, the granitic areas of Mourne, Carlingford, and Ballynahinch being excepted. It is not intended in the present paper to

do more than notice the rocks which occupy the north-eastern portion of the area situated wholly in the County Down.

PREVIOUS NOTICES OF THE DISTRICT.

Perhaps the earliest reference to the rocks of this area is that by Drs. Berger and Conybeare, made in 1816. (1) These pioneers of Irish Geology pointed out the similarity between the County Down rocks and those of South Scotland. On the large geological map compiled by Sir Richard Griffith in 1839 the area is put down as Clay-slate or Greywacke-slate belonging to the Transition series. Dr. Bryce in 1852 stated as follows (2) :—"The County Down contained two granitic tracts which seem to have been elevated at different epochs. They are separated from one another, and each is wholly enclosed by a thick band of metamorphic slate, gneissose in its lower part, and passing upwards into flinty and common clay-slate. Superimposed conformably upon these are other slates of less crystalline type, whose aggregate thickness is enormous, and whose upper portions have yielded a few imperfect fossils, which seem to make them referable to the Lower Silurian Group; but as yet no definite line has been made out to justify a classification." Sir Roderic Murchison states in 1854 (3) :—"It is believed that the Schists of Down are of the same age as the Graptolitic Schists of Wigton and Galloway." J. Beete Jukes, F.R.S., after referring to the Chair of Kildare, which contains Bala fossils (4), states that "another great tract of apparently similar beds stretches from the centre of Ireland, Cavan, &c., to the coast of Down. Among these, however, a portion certainly belongs to the Llandeilo Flags, as near Bellewstown, on the confines of Dublin and Meath, an assemblage of Llandeilo fossils were found."

Many years ago it was known to members of the Club that Graptolites occurred in the County Down, and specimens were obtained by them at Tullygarvan, near Saintfield, from the debris of a shaft which was there sunk in the Silurian rocks in search for coals (5); none were, however, sufficiently perfect for identification.

(1). Transactions of the Geological Society of London, Vol. III.

(2). Report of the British Association (1852).

(3). Siluria (1854)—foot note, p. 166.

(4). Manual of Geology (1862), p. 454.

(5). The slightest knowledge of the evidence furnished by these fossils would have saved a vast amount of useless expenditure and misdirected efforts here, and at many other localities throughout the district. The projectors in their search for coals were doubtless misled by the resemblance of the black Graptolitic bands to the rich carbonaceous shales of the Coal Measures.

The Geological Survey in its progress northward has almost completed the mapping of this area. The maps of the County Down were published in 1871-72 (1). The Silurians are either set down on them in general terms as Lower Silurian, or areas indicated by letters but whose boundaries are often undefined, are assigned to the Bala or Caradoc, and to the Llandeilo. In their examinations of the rocks several fossil localities were discovered which had hitherto been overlooked, and in the "Explanatory Memoirs" lists of species were published from time to time (2).

The want of precision throughout the foregoing notices is no doubt due to the highly disturbed nature of the strata and comparatively uniform lithological character of the rocks, making the determination of their stratigraphical relations a matter of very great difficulty. This difficulty was much enhanced by the absence, until very recently, of fossil evidence sufficient to allow their correlation with other deposits.

LITHOLOGICAL CHARACTER OF THE ROCKS OF THE DISTRICT.

Lithologically the rocks consist for the greater part of grey and purple grits—occasionally conglomeritic—pale grey or greenish slates and flags, and a few widely separated bands of black shales. The latter, though forming but a small portion of the entire rocks here exposed, constitute a group which will claim most attention in the following brief notice. In them are found all the fossils which are enumerated in the accompanying table, and it is from a careful study of their fossil contents that we are enabled to arrive at an estimate of their geological position, and that of the barren grits and slates associated with them. The usual dip of the rocks is to the south-east and south, at angles varying from 30° to vertical. Their continuity is much disturbed by faults and contortions, and their upturned edges, where exposed, bear evidence of having suffered much from denundation. Almost the entire rocks of the area are obscured by drift, and with the exception of the coast-line, few good sections can be seen. The grey and purple grits have not as yet yielded any fossil remains, and it is only within the past few months that they have been detected in the grey slates, a notice of which will be given further on.

(1). Geological Survey of Ireland, maps 29, 36, 37, 38, 47, 48 and 49.

(2). Explanatory Memoirs, accompanying maps 37, 38, 29, 48, 49, 50, and 61.

FOSSIL LOCALITIES.

TIEVESHILLY.—About two miles south of Portaferry, and a short distance east of the bridge on the main road over Carstown Burn, are several quarries formerly worked for roofing-slate. The quarries are low lying, and in winter are filled with water. In dry seasons, however, the rock can be reached, and proves to be thin fissile slates and flags, varying in colour from almost black to pale greenish gray: the dip is nearly vertical, and they have the usual strike of about N.E. and S.W. The dark bands are very fossiliferous, and many of the fossils are beautifully preserved; fifteen species have been obtained from this locality, all, with the exception of one crustacean, belonging to the Graptolitidæ.

COALPIT BAY.(1)—This locality is situated on the shore, about three-quarters of a mile south of Donaghadee, and is only accessible when the tide is low. As it is the best exposure of these fossil-bearing rocks, a more detailed account of it is here given.

A series of massive grey grits and slates occur to the southward of the little bay, dipping at high angles to the south, and terminating northward in a low escarpment. At their base we find the following rocks, upon which they apparently rest conformably:—

1. Massive black slates, with several light-coloured clay bands; the slates containing, among others, the following characteristic fossils:—

RASTRITES PEREGRINUS, *var.* HYBRIDUS, *Lapw.*
MONOGRAPTUS SEDGWICKII, *Portl.*
,, INTERMEDIUS, *var.* PROTEUS, *Barr.*
MONOGRAPTUS TENUIS, *Portl.*
,, LOBIFEROUS, *M'Coy.*
DIPLOGRAPTUS HUGHESII, *Nich.*
,, SINUATUS, *Nich.*
,, TAMARISCUS, *Nich.*
CEPHALOGRAPTUS (DIPLOGRAPTUS) COMETA, *Geinitz.* - - 10 feet.

2. Dark green mudstones, with several bands, each from two to four inches thick, of buff and light purple clays—unfossiferous—35 feet.

(1). So named from a futile attempt to find coals in the black Graptolitic slates here exposed.

3. Massive black slates and shales rich in fossils; the following are a few of the most characteristic :—

RASTRITES PEREGRINUS, *Barr.*
MONOGRAPTUS GREGARIUS, *Lapw.*
,, CONCINNUS, *Lapw.*
,, SANDERSONI, *Lapw.*
,, TRIANGULATUS, *Harkn.*
,, SPIRALIS, *var.* FIMBRIATUS, *Nich.*
DIPLOGRAPTUS FOLIUM, *His.*
,, TAMARISCUS, *Nich.*
,, VESICULOSUS, *Nich.*
DIMORPHOGRAPTUS ELONGATUS, *Lapw.*
DISCINOCARIS BROWNIANA, *Woodw.*
DAWSONIA CAMPANULATA, *Nich.*

This area is considerably covered with shingle and sand, and the rocks are intersected by several faults carrying them to the north-east; their thickness may be set down at about - - - - - 100 feet.

4. A dyke composed of pale grey finely crystalline calcareous rock running easterly (1) - - - - 6 feet.

5. Pale grey and greenish mudstones, greatly shattered and unfossiliferous. - - - - - about 65 feet.

Near the base of these mudstones is a thin band of black shale greatly crushed, in which no fossils have yet been detected, but higher up in the mudstones a fragment of black shale, about two feet in diameter and several inches thick was found containing well-marked specimens of *Dicellograptus Forchammeri*, Geinitz.

6. Black shales highly indurated and containing numerous flinty bands, and nodules and veins of iron pyrites. The less altered portions are rich in fossils and have yielded the following :—

CLIMACOGRAPTUS TRICORNIS, *Carr.*
,, CŒLATUS, *Lapw.*
,, BICORNIS, *var.* PELTIFER, *Lapw.*
DICELLOGRAPTUS ELEGANS, *Carr.*
DICRANOGRAPTUS FORMOSUS, *Hopk.*
DICRANOGRAPTUS ZIC ZAC, *var.* MINNIMUS, *Lapw.*
ACROTRETA NICHOLSONI, *Dav.*
ACROTHELE GRANULATA, *Linrs.*

These shales are too much shattered and crumpled to allow of their thickness being exactly estimated. It may, however, be roughly put down at about 50 feet. They form the ridge of a sharp anticlinal, which has for its axis

(1). Geological Survey of Ireland—Explanatory memoir to sheets 37, 38, & 29. p. 31.

another series of mudstones somewhat resembling those noted in paragraph 5 of this section. The succeeding rocks in order, still going northward, are a repetition of the mudstones noted in paragraph 5, partially hidden by sand. No rocks are now seen for about 60 feet, and a fault here breaks the continuity of the section, the next beds exposed being—

7. Black fissile shales and slates dipping S. 20 E. at 75°. These suddenly curve over to the opposite direction, and a few feet further north regain their original dip.

The section is again lost for several hundred feet, and the next rock exposed is massive grey grits and slates, similar to those on the south side of the bay, and having the normal dip of the rocks of the district.

TULLYGARVAN.—This fossil locality is situated about one and a half miles ~~east~~ west of Ballygowan Railway station (Belfast and County Down Railway), in the bed of a small stream which flows eastward through the grounds of Tullygarvan House. The rocks near to the shaft which was sunk in search for coals are of a black carbonaceous character, greatly contorted, and much stained with iron. No fossils have yet been detected in them; but judging from the few traces obtained from the debris of the sinking, and from the character of their associated mud-stones, they seem to correspond with those in the axis of the anticlinal at Coalpit Bay. Black-slates are exposed further up the stream in several places, yielding in all seven species of Graptolites, referable to the beds described in paragraph 3 of the same locality; thus pointing to the probability that the rocks here shewn are the westerly extension of those beds.

ORLOCK POINT.—On the shore to the north-east of the coastguard station, black and red shales are exposed between tide marks for about 200 yards. They are bounded on the north and south by purple slates, dipping S. 20 E. at angles varying from 40° to vertical. It is impossible, however, to arrive at the order of occurrence of the black and red shales here exposed, as they are much disturbed by minor faults cutting through them in various directions. The continuity of the section is also broken by a dyke of fine grained Elvanite 10 feet wide, running from west to east, almost in the direction of the strike of the rocks. This dyke undoubtedly occupies the line of a more important fault as we find the rocks on the south side of it consist of black flinty shales, while to the north these are replaced by brown and purple arenaceous beds which pass

up into the prevailing purple and grey slates of the district. Graptolites have been found in the less altered portions of the black shales, they are, however, very indistinct, and only two species—*Leptograptus flaccidus*, Hall, and *Diplograptus truncatus*, Lapw.=*pristis*, His.—could with certainty be made out. In a thin pale grey arenaceous band associated with them occur plant remains, which have been identified as belonging to the genus *Buthotrephis*, but apparently of a species not hitherto figured.

CARNALEA.—On the shore north of Carnalea Railway Station (Belfast, Holywood and Bangor Railway) just where a small stream flows into the Lough, there is a small exposure of black shales almost vertical. To the south-east they abut against grey slates and grits, and seaward they are covered with shingle and sand. These black shales are rich in fossils, but from the shivery nature of the beds they are usually in a fragmentary state. Among the most characteristic are the following :—

DIPLOGRAPTUS TRUNCATUS, *Lapw.*
,, QUADRIMUCRONATUS, *Hall.*
LASIOGRAPTUS HARKNESSI, *Nich.*
RETIOLITES FIBRATUS, *Lapw.*
DICELLOGRAPTUS FORCHAMMERI, *Geinitz.*
,, ELEGANS, *Carr.*
LEPTOGRAPTUS FLACCIDUS, *Hall.*
CLIMACOGRAPTUS TUBULIFERUS, *Lapw.*

CRAWFORDSBURN.—Immediately opposite Crawfordsburn House, on the shore near low water mark, grey mudstones and black shales occur, the general strike of which is N. 20 E. In one place, however, the beds are broken sharply across, bent in a direction exactly at right angles to it, and in part inverted. Fossils are few and fragmentary.

BALLYGROT.—This locality, named from the townland in which it occurs, is near Grey Point, and is also situated on the shore. The rocks consist of a series of pale green mudstones and black shales, which are again followed by a band of grit and an exposure of several hundred feet of black ferruginous shales, containing flinty bands, and which are much threaded with quartz. Faulted against these to the north is a series of purple and grey shales, which are again followed by black shales similar in character to last. Irregularly bedded grits and slates succeed these, and prevail for a considerable distance. No fossils have been detected in the grey or purple shales, but the less altered

portions of the black ferruginous bands are exceedingly rich, and have yielded a large series, among which are the following :—

DIPLOGRAPTUS TRICORNIS, *Carr.*
,, ANGUSTIFOLIUS, *Hall.*
GLOSSOGRAPTUS HINCKSII, *Nich.*
CLATHOGRAPTUS CUNEIFORMIS, *Lapw.*
CLIMACOGRAPTUS SCHARENBERGI, *Lapw.*
,, BICORNIS, *Hall.*
,, ,, *var.* PELTIFER, *Lapw.*
,, ,, *var.* TRIDENTATUS, *Lapw.*
,, CŒLATUS, *Lapw.*
,, PEREXCAVATUS, *Lapw.*
DICRANOGRAPTUS RAMOSUS, *Hall.*
,, NICHOLSONI, *Hopk.*
,, FORMOSUS, *Hopk.*
DICELLOGRAPTUS MOFFATENSIS, *Carr.*
,, ,, *var.* DIVARICATUS, *Hall.*
DIDYMOGRAPTUS SUPERSTIS, *Lapw.*
CŒNOGRAPTUS GRACILIS, *Hall.*
,, PERTENUIS, *Lapw.*
,, SURCULARIS, *Hall.*
THAMNOGRAPTUS TYPUS, *Hall.*
CORYNOIDES CALICULARIS, *Nich.*
,, CURTUS, *Lapw.*

CRAIGAVAD.—The fossils noted from this locality were obtained from the railway cutting about three-quarters of a mile east of the station. A very small exposure of black shales occur associated with purple shales and grits. The few fossils obtained point to the similarity between the containing beds and those of Ballygrot, of which they are doubtless the south-westerly extension.

The accompanying table gives a list of the fossils which I have collected from the foregoing localities. The total number is seventy-five species and thirteen named varieties, in all representing twenty-five genera. This is exclusive of many doubtful forms that have been laid aside waiting better specimens to enable their identification; also, several that are undoubtedly new, but which are either too fragmentary or badly preserved to warrant a diagnosis.

The following is a synopsis of those already named, shewing the zoological groups to which they belong :—

SUB-KINGDOM.	CLASS.	SPECIES.	VARIETIES.
CŒLENTERATA.	RHABDOPHORA.	68	13
ANNULOSA.	CRUSTACEA.	3	
MOLLUSCA.	BRACHIOPODA.	3	
PLANTÆ.		1	

It will be noticed from the foregoing that a large proportion of the fossils belongs to one class—namely, the Rhabdophora or Graptolithina. It is not my intention to offer any suggestions as to the conditions which prevailed during the deposition of these fossiliferous black bands, conditions alike favourable to this singular group of organisms, and apparently unsuitable to others. It may be observed, however, that no group affords a better index to the palæontologist in his endeavours to unravel the sequence of rocks of Silurian age than does the Graptolithina. The number of known species is very large, and it has been ascertained that the vertical range of most of them is very restricted—many, indeed, being confined to zones of but a few inches in thickness. The immense profusion also in which they frequently occur stamps each zone with a character easily recognisable by those who study their form and character.

The similarity of the County Down rocks to those in South Scotland was conjectured, as before stated, so early as 1815. This conjecture appears to have been founded more upon the general appearance of the rocks of the two areas than upon any positive evidence that was then obtained from them Subsequent writers did little but repeat these early opinions ; and I am unable to find any evidence adduced tending to prove their identity.

The true relationship of the Silurian strata of South Scotland, and their exact position in the geological system, were long a matter of debate, and claimed the attention of many of the best geologists of Britain. To Mr. Charles Lapworth, of St. Andrews, is, however, due the honour of having finally succeeded in unravelling the many knotty problems which the rocks of that district presented. A brief *resumé* of the conclusions arrived at by that gentleman, as given in a most exhaustive paper read before the Geological Society of London (1), may here be given, as I trust to be able to prove that they bear with equal force upon the rocks of the area under consideration.

The Silurians of South Scotland are best shown in the neighbourhood of the town of Moffat, in Dumfries. The prevailing rocks consist of a vast series of grey and purple greywackes and slates, with occasional bands of conglomerates, all dipping somewhat uniformly to the N.N.W. at high angles. Exposed in some of the deeper valleys and stream courses is another set of rocks of a totally different character, consisting of black carbonaceous shales and slates, swarming with Graptolites; associated with these beds are pale green and grey unfossiliferous mudstones. These black shales and their associated mudstones, which have been aptly designated the Moffat Series, occupy lenticular or boat-shaped areas in the mass of the barren greywackes, and form extended lines

(1.) Quarterly Journal Geol. Soc., London. Vol. XXXIV., p. 240.

more or less parallel, and often miles in length. They are found at intervals throughout the northern half of the uplands, from the North Sea to the Irish Channel, and follow the general direction of the strike of the beds. Their well-marked mineralogical character and their peculiar fauna at once distinguish them from the monotonous greywackes, and afford the geologist data upon which to work out the interrelation of the rocks of the entire series. Without attempting to follow the author in his description of the many sections and diagrams given in elucidation of his subject, I may briefly state that the rocks are found to be arranged in elongated anticlinals, running in a direction from about N.E. to S.W., and that the sub-parallel bands of black graptolitic shales of the Moffat Series form the axes of these anticlinals, and are only seen where denudation has cut sufficiently deep to expose them. The Moffat Series is thus proved to have been one continuous deposit, inferior in position to the prevailing greywackes through which it rises. Where best exposed the Moffat Series naturally falls into three divisions—an Upper, Middle, and Lower—named respectively the Birkhill, Hartfell, and Glenkiln Shales, from the several localities in which each division attains its greatest development. These three divisions possess distinctive lithological features; but as the entire group is full of perplexing contortions and inversions, and as the continuity of the beds is greatly broken by numerous faults running in different directions, it was impossible to work out their sequence from stratigraphical evidence alone. The aid afforded by the contained fossils is, however, most satisfactory, and has enabled the author not only to prove that the divisions must be assigned to different geological periods, but they are each divisible into several distinct zoological zones.

The correlation of these various sub-divisions with the typical Silurian area in Wales, and their foreign equivalents, is gone into with great minuteness by the author. I shall content myself by merely giving the conclusions arrived at, and beg to direct those anxious for further details in this department of the subject to the paper itself.

The lowest, or Glenkiln Shales, have been referred to the Upper Llandeilo, their nearest representatives in Wales being beds of that age yielding Graptolites, in the neighbourhood of Llandridod, Meadow Town, and Aberiddy Bay. Their American and Swedish equivalents bear out this view, and point to a high position for them in the Upper Llandeilo Series. The Hartfell beds have been proved to be the attenuated representatives of the Bala and Caradoc, and the Birkhill Shales correspond with the Coniston mudstones of the Lake District, which are of Lower Llandovery age. The accompanying table will give more clearly these Scottish divisions and sub-divisions, and I shall now proceed to give the evidence that has enabled me to append the columns relating to County Down.

Table shewing the Divisions and Sub-Divisions of the Moffat Series, and their equivalents in County Down.

	Wales	South Scotland.		County Down.	
		Scottish sub-divisions.	Number of Species.	Where represented.	Number of Species.
Middle Silurian.	Lower Llandovery.	Hawick Beds. Gala Group. Up. Birkhill Shales. Lwr. Birkhill Shales.	43.	Tieveshilly? Ballygowan, &c., &c. Coalpit Bay, Tullygarvan? Coalpit Bay.	14. 36.
Lower Silurian.	Bala, or Caradoc.	Up. Hartfell Shales, &c. Lwr. Hartfell Shales.	36.	Coalpit Bay, Tullygarvin? Carnalea, Orlock Point.	11.
	Up. Llandeilo.	Up. Glenkiln Shales.	35.	Coalpit Bay, Ballygrot. Craigavad, &c.	27.

As before stated, the section at Coalpit Bay is the best exposure of these fossil-bearing rocks in the district. The lowest are barren mudstones, which form the axis of a sharp anticlinal, and are followed by black flinty shales containing 11 species of Graptolites. The same species, associated with 15 others, are also found at Ballygrot, where a wider area of rock is exposed, thus indicating that the rocks of these widely separated localities are but parts of the same bed. This group of 26 species enables us at once to correlate these beds with those of South Scotland; and it is interesting to find that they agree almost fossil for fossil with those from the representative localities of Berrybush Burn and Black Linn, which are the upper beds of the Glenkiln Shales. The small exposure in the railway cutting near Craigavad has also yielded fossils of this age, and is doubtless but a south-westerly extension of the Ballygrot Beds. The same may be said of the black shales still farther to the south-west, in a quarry near Cultra, although I have not been able to procure any recognisable fossils from the greatly crushed rocks of this latter locality.

The lower Glenkiln Shales, which in South Scotland are comparatively unfossiliferous, may be represented in Ireland by the grey mudstones which form the centre of the anticlinal at Coalpit Bay, and by the series of unfossiliferous grey and purple shales associated with the black bands at Ballygrot.

The next beds in ascending order at Coalpit Bay are the barren mudstones noted in the detailed account of that locality at paragraph 5. The only fossils found associated with them were obtained from a fragment of black shale folded up in their broken strata. This fragment had doubtless been derived from some bed intimately associated with the mudstones, and which may yet be detected *in situ* among the shattered black bands at their base. The fossils which it has yielded, though few in variety, include *Dicellograptus Forchammeri*, Geinitz; *Climacograptus*, sp.? and *Diplograptus truncatus*, Lapw.;—species highly characteristic of a thin, but persistent, band of shale occurring near the base of the barren mudstones of the Upper Division of the Hartfell Series (1). This circumstance, coupled with the identity in lithological character of the barren beds in the two countries, leaves no doubt but that these Coalpit Bay Mudstones are the representative of that sub-division. This being admitted, it is evident that the rich beds of the Lower Hartfell Series are absent here, having either thinned out or been lost by faulting. The latter view is more probable, as we find them undoubtedly represented by the fossiliferous black-shales of Carnalea, which have yielded ten species of Graptolites, the following six species being peculiar to that sub-division:—*Diplograptus truncatus*, Lapw.; *Diplograptus quadrimucronatus*, Hall; *Lasiograptus Harknessi*, Nich.; *Retiolites*

fibratus, Lapw.; *Climacograptus tubuliferus*, Lapw.; *and Dicellograptus Forchammeri*, Geinitz. The remaining four species are common to the Hartfell, and the underlying Glenkiln Shales. So far as can be judged from the meagre list of fossils obtained at Orlock Point, the beds there exposed also belong to this group.

Again returning to the section in Coalpit Bay, we find the mudstones which have just been referred to the Upper Hartfell Series are separated from the next beds in ascending order, by a dyke which runs almost parallel to the strike, and which seems to occupy the line of an east and west fault. The rocks immediately south of this dyke are very rich in fossils, 36 species having been obtained from them, although the area exposed is of but very limited extent. The palæontological break between these and the preceding beds is most complete, not one of the extensive series of fossils being common to the two rock groups. Not only are the species different, but a marked change also takes place in the generic character of the fauna. All the old types of compound forms such as Cœnograptus, Thamnograptus, Dicellograptus, Dicranograptus, Leptograptus, &c., have disappeared, and their places have been supplied by the simpler genera Monograptus and Rastrites.

This extensive series of fossils admits at once of the correlation of the containing beds with the Birkhill Shales of the Moffat District, with the lower division of which as exposed at Dobbs Linn they almost exactly correspond, both in lithological character and fossil contents. In these beds also for the first time in the County Down rocks are we enabled to identify the life-zones so ably worked out in the Scottish beds. The zone of *Diplograptus acuminatus*, which is at the base of Birkhill Shales, is found, in part at least, quite close to the dyke above mentioned. The well-marked zone of *Diplograptus vesiculosus* follows it with a rich assemblage of species, often beautifully preserved. The succeeding zone of *Monograptus gregarius* is also easily recognised by the immense profusion in which that fossil, associated with *Rastrites peregrinus* (type) and other forms abound in it.

A series of greenish grey mudstones, with thin layers of white clay, separates the foregoing zones from the next fossil bands. The upper horizon of this barren group is in Scotland taken as the boundary line between the Lower and Upper Birkhills. The only other zone which can with certainty be recognised at Coalpit Bay, is that of *Diplograptus* (Cephalograptus) *cometa*, which occurs at the top of the fossil bearing beds. It is just possible that the zone of *Monograptus spinigerus=Sedgwicki*, which follows the latter in Scotland, may be

(1). Quartl. Journal Geol. Soc., London. Vol. XXXIV., p. 316.

represented and in part combined with it, as several of its most characteristic fossils have been detected in its highest bands.

The top of the Upper Birkhill Shales, marked by the zone of *Rastrites maximus*, has not yet been detected in Ireland; did it occur, its peculiar group of fossils would at once make it recognisable. Judging, however, from the fact that these upper beds thin out as they extend westward from the typical Moffat area, and that the zone of *R. maximus* seems to be absent from Wigtonshire, it is not likely that it will be detected here.

The grits and slates already referred to, which immediately overlie these black shales, are similar in lithological character to those of South Scotland. There they are the principal rock which forms the mountainous region known as the Southern Uplands; in County Down, however, though equally developed, their elevation is inconsiderable. As we pass southwards along the promontary of the Ards, these rocks assume in places a more flaggy and slaty character, and are in the neighbourhood of Greyabbey extensively quarried and formed into roofing slates. On some of the surfaces exposed at these quarries traces of organisms have been detected—tracks of annelids are abundant, —but the only forms that admit of identification are *Crossopodia Scotica*, M'Coy; *Nemertites tenuis*, M'Coy; and *Nemertites sp.?* Still further south, near Portaferry, bands of dark slate occur containing a group of Graptolites strikingly different from any we have yet met with in the district. The palæontological break between these and even the highest of the Coalpit Bay zones is almost complete. An examination shows that of the 14 species obtained from them, only 3 are common to the two localities, and the 11 which make their appearance for the first time indicate a much higher horizon for the containing beds than those in the northern portion of the county. These latter beds have no exact palæontological representatives in the typical districts of Scotland or Wales; their nearest is, perhaps, the rocks of Upper Middle Silurian age known as the Gala Group, occurring in the neighbourhood of Galashiels (1). The presence, however, of *Monograptus Riccartonensis* and other Upper Silurian species, and the absence of many of the Upper Moffat forms which occur in that series in South Scotland, points to a higher place in the Silurian System than that to which the Gala Group has been assigned. They are most probably the exact equivalents of the Hawick rocks of Scotland, which intervene between the Gala beds and the Upper Silurian of Riccarton (2); but as no

(1). Lapworth, on the Lower Silurian Rocks in the neighbourhood of Galashiels. —Trans. Edinburgh Geol. Soc., Vol. II., p. 46.

(2). Lapworth, On Scottish Monograptidæ.—Geo. Mag., 1876, p. 550.

fossils have yet been detected in these beds in Scotland, the evidence depends solely upon the peculiar fauna of the Irish beds. Their representatives in the Lake Disirict are probably the Knock beds exposed near Ambleside, which are considered to be, if not Upper, at least the passage between the Upper and the Middle Silurians (1). If this view of their position be admitted, it is evident that the grey grits and conglomerates which come in between this fossil band and the black shales at Coalpit Bay naturally fall into the place of the Gala Series. The evidence—in the absence of reliable fossils—which they afford tends to support this view. The conglomerates referred to constitute a well-marked zone, and consist of small pebbles of quarts, flakes of black shale, &c., in a grey gritty base. They are well shewn in the quarries at Ballygowan and elsewhere throughout the county, and are identical in character to beds which mark the base of the Gala Group in Scotland. The remaining rocks of this series consist of alternations of coarse grits and slates, void of any peculiar feature upon which to fix a horizon. It is this monotonous character of strata stretching over such vast areas in both Scotland and Ireland, and dipping in the same general direction, that has hitherto baffled all attempts to unravel their sequence, or define their exact position in the Silurian System. From the above, however, it is clear that they must be considered as of Gala age, the position of which is defined as the top of the Middle Silurian.

It will perhaps be difficult to define the boundary line between this Irish Gala group and the Portaferry beds. The fossils in the latter at Tieveshilly undoubtedly occupy only a black slaty band, the horizon of which in the series has not yet been fixed. The few organisms on the surfaces of the grey slates near Greyabbey afford very little help, but tend to prove that the rocks in which they occur belong to the Gala rather than to the Portaferry series.

It is to be hoped that the boundary line between these two sets of rocks may yet be defined; but the close resemblance between the unfossiliferous beds of both, and the heavy covering of drift by which they are hidden, will render this a work of extreme difficulty.

CONCLUSIONS.

THE Silurian Rocks of County Down are from the foregoing proved to belong to several distinct divisions of the system—

1st. The lowest, exposed at Coalpit Bay, the shales of Ballygrot, Craiga-

(1). Harkness and Nicholson on the Strata and their Fossil Contents, between the Barrowdale Series of the North of England and the Coniston Flags.—Quartl. Jourl. Geol. Soc., London, Vol. XXXIII., p. 461.

vad, &c., are the representatives of the Glenkiln Shales, the equivalents of the Upper Llandeilo of Wales.

2nd. The black shales at Carnalea, and the barren mudstones at Coalpit Bay, represent respectively the Lower and Upper Hartfell Series, the equivalents of the Bala or Caradoc.

3rd The black shales of Coalpit Bay, characterised by the zones of D. acuminatus, D. vesiculosus, M. gregarius, and D. cometa, represent in part both the Lower and Upper Birkhill shales, which are paralleled with the Lower Llandoveries.

4th The grits and conglomerates which immediately succeed the latter are of the same age as the Gala Series, and occupy a high place in the Middle Silurians.

5th. The black shales and associated flags at Tieveshilly, near Portaferry, occupy either the extreme top of the Middle, or the base of the Upper Silurians, and are the highest Silurians yet recognized in the North-east of Ireland.

The geographical relation of the area under consideration to that of South Scotland and the general direction of the strike of the rocks in both districts, would naturally lead to the expectation of a certain degree of similarity between their geological characters; from the foregoing, however, it is clear that not only generally, but in detail, do they correspond in a remarkable degree. While it would, perhaps, be impossible, owing to the imperfect manner in which the fossil bands are exposed, to unravel the sequence of the various beds in County Down from an examination of them alone, the key afforded by the recent researches in the Scottish beds has made the subject a matter of ease. We are thus enabled for the first time, with some amount of certainty, to arrive at conclusions regarding the physical geology of the district. The three graptolitic shale bands and their associated mudstones have been overlaid by the grits and conglomerates so conspicuous in the county; all were folded into vast waves, the crests of which ran in a direction from about north-east to south-west. Subsequent denudation completely altered the contour of the district; and judging from the remnants of Carboniferous strata at Castle Espie and Cultra, it seems to have been covered by rocks of that age, and to have been again upheaved and subjected to denuding agencies, which probably left it in almost its present state. The granitic protrusions of the Mourne and Ballynahinch Mountains are supposed to have taken place during the Carboniferous epoch,

TABLE SHOWING THE DISTRIBUTION OF THE FOSSILS IN COUNTY DOWN, AND THEIR RANGE IN THE MOFFAT SERIES OF SOUTH SCOTLAND.

ABBREVIATIONS.—r, rare; v r, very rare; c, common; v c, very common. Species marked * have not yet been detected in Ireland.

LIST OF SPECIES.	Reference to Plates and Figs.	County Down. Tieveshilly	Coalpit Bay	Tullygarvan	Carnalea	Orlock Point	Crawford's Burn	Ballygrot	Craigavad	Moffat Series. Birkhill Shales	Hartfell Shales	Glenkiln Shales
GRAPTOLITHINA.												
RASTRITES, *Barrande.*												
,, peregrinus, *Barr.* Grapt. de Boheme, Pl. IV.	Plate V. fig. 1	...	v c	...	...	...	...	...	...	x	..	...
,, ,, *var.* hybridus, Lapw. Geo. Mag. 1876. Pl. X. ...	,, 2	...	r	...		...	...	...	...	x	...	...
MONOGRAPTUS, *Geinitz.*												
,, triangulatus, *Hark.* Q.J.G.S., Vol. VII., Pl. I.	,, 14	...	v c	r	...	...	...	...	...	x	...	...
,, spiralis, *Geinitz.* Leon & Bronn, Jahrbuch für Min., 1842. Pl. X. ...	,, 12	r	...	...	...	...	...	...	...	x	...	...
,, ,, *var* fimbriatus, *Nich.* Q.J.G.S., Vol. XXIV., Pl. XX. ...	,, 17	...	v r	...	...	...	...	...	...	x	...	...
,, ,, communis, *Lapw.* Geo. Mag., 1876. Pl. XIII. ...	,, 16	...	r	...	...	...	...	...	...	x	...	...
,, ,, proteus, ? *Barr.* Grapt. de Boheme. Pl. IV. ..	,, 18	r	r	...	...	...	...	...	...	x	...	...
,, Sedgwicki, *Portlock.* Geo. Rept. Derry and Tyrone. Pl. XIX. ...	,, 15	...	r	...	...	...	...	...	...	x	...	...
,, turriculatus, *Barr.* Grapt. de Boheme. Pl. III.	,, 11	c	...	...	...	...	...	...	...	x	...	...
,, crispus, *Lapw.* Geo. Mag., 1876. Pl. XX....	,, 13	r	..	...	...	...	...	..	...	...	...	...
,, exiguus, *Nich.* Q.J.G.S., Vol. XXIV. Pl. XIX.	,, 9	v c	...	...	...	...	...	...	..	.	...	...
,, Barrandei, *Suess.* Bohmische Grapt. Taf. IX.	,, 21	r	...	...	...	...	...	...	...	...	...	...
,, runcinatus, *Lapw.* Geo. Mag., 1876. Pl. XX.	,, 7	...	v r	...	...	...	...	...	...	x	...	...
,, lobiferus, *M'Coy.* Brit. Pal. Fossils Pl. I....	,, 6	...	c	...	...	...	...	...	...	x	...	...
,, ,, *var.* pandus, *Lapw.* Var. nov.	VI. 3	r	...	...	...	...	...	...	...	...	...	...
,, priodon, *Bronn.* Lethea. Geogn. Pl. I.	V. 24	v c	...	...	...	...	...	...	...	...	...	...
,, Riccartonensis, *Lapw.* Geo. Mag., 1876. Pl. XIII.	,, 23	c	...	...	...	...	...	...	...	...	...	...
,, Galaensis, *Lapw.* Geo. Mag., 1876. Pl. XII.	VI. 1	c	...	...	...	...	...	...	...	...	...	...
,, M'Coyi, *Lapw.* sp. nov.	,, 2	v r	...	...	...	...	...	...	...	...	...	...
,, Hisingeri, *Carr.* Geo. Mag,, 1876. Pl. XII.		v r	...	...	...	..	...	...	...	x	...	...
,, ,, *var.* jaculum, *Lapw.* Geo. Mag., 1876. Pl. XII. ...	V. 20	r	r	r	...	..	...	...	...	x	...	...
,, cyphus, *Lapw.* Geo. Mag., 1876. Pl. XII....	,, 25	r	r	...	...	...	...	...	...	x	...	..
,, leptothecæ, *Lapw.* Geo. Mag., 1876. Pl. XII.	,, 22	...	v r	...	...	...	...	...	...	x	...	...
,, concinnus, *Lapw.* Geo. Mag., 1876. Pl. XI.	,, 19	...	c	...	...	...	..	...	...	x	...	...
,, gregarius, *Lapw.* Geo. Mag., 1876. Pl. X.	,, 4	...	v c	c	...	...	..	...	...	x	...	...
,, argutus, *Lapw.* Geo. Mag., 1876. Pl. X.	,, 5	...	r	...	...	...	...	...	...	x	..	...
,, Sandersoni, *Lapw.* Geo. Mag., 1876. Pl. XI.	,, 8	...	r	v r?	...	...	...	...	..	x	...	...
,, tenuis, *Portlock.* Geo. Rept. Derry and Tyrone. Pl. XIX. ...	,, 10	...	c	r	...	...	...	...	...	x	...	...
,, attenuatus, *Hopk.* Geo. Mag., 1872. Pl. XII.	,, 3	...	r	...	...	...	...	...	...	x	...	...
DIMORPHOGRAPTUS, *Lapworth.*												
,, Swanstoni, *Lapw.* Geo. Mag., 1876. Pl. XX.	VI. 5	...	v r	...	...	...	...	...	...	...	...	...
,, elongatus, *Lapw.* Geo. Mag., 1876. Pl. XX.	,, 6	...	v r	...	...	...	...	...	...	x	...	...
CEPHALOGRAPTUS, *Hopkinson.*												
,, cometa, *Geinitz.* Die Graptolithen, Taf. 1	,, 4	...	v r	...	...	...	...	...	...	x	...	...
DIPLOGRAPTUS, *M'Coy.*												
,, *acuminatus, *Nich.* Geo. Mag., 1867. Pl. VII.	,, 7	...	...	...	...	...	...	...	...	x	...	...
,, confertus, *Nich.* (modestus, Lapw.) Q.J.G.S., Vol. XXIV. Pl. XIX.	,, 8	...	r	...	...	...	..	...	...	x	...	...
,, sinuatus, *Nich.* Ann. Mag. Nat. His., 1869. Pl. XI.	,, 9	...	c	...	...	...	...	...	...	x	...	...
,, tricornis, *Carr.* Trans. Royal Phys. Soc. Edin. p. 408	,, 10	..	v r	...	..	...	...	r	...	...	x	x
,, angustifolius, *Hall.* Palæo. New York. Vol. III., p. 515 ...	,, 11	...	r	...	...	...	...	r	...	...	...	x
,, tamariscus, *Nich.* Q.J,G.S., Vol. XXIV. Pl. XIX.	,, 12	...	c	...	...	...	...	...	...	x	...	...
,, dentatus, *Bronn.* Hist. des Veget. Foss., T. I., Pl. 6	,, 13	...	...	...	...	...	...	r?	...	...	...	x
,, Hughesi, *Nich.* Ann. Mag. Nat. His., 1869. Pl. XI.	,, 14	...	r	...	...	...	...	...	...	x	...	...
,, insectiformis, *Nich.* Ann. Mag. Nat. His., 1869. Pl. XI. ...	,, 15	...	v r	...	...	...	...	...	..	x	...	..
,, folium, *His.* Leth: Suec. Supp., Taf. 35	,, 16	...	v c	...	...	...	...	...	...	x	...	...
,, truncatus, *Lapw.* sp. nov.	,, 17	..	...	...	v r	c	...	...	...	...	x	..
,, foliaccus, *Murch.* Murch. Silr. Syst. Pl. XXVI.	,, 18	...	...	...	...	...	...	v r	...	x	x	...
,, vesiculosus, *Nich.* Ann. Mag. Nat. His.; 1869. Pl. XI. ...	,, 19	...	r	..	...	...	...	...	...	x	...	...
,, quadrimucronatus, *Hall.* Grapt. Quebec Group. Pl. XIII. ...	,, 20	...	...	...	v r	...	...	...	...	...	x	...
,, Whitfieldi, *Hall.* Grapt. Quebec Group. Pl. B ...	,, 21	...	...	...	v r	...	...	...	...	...	...	x
,, *mucronatus, *Hall.* Palæo. New York. Vol. I. Pl. LXXIII. ...	,, 22	...	...	...	...	...	...	...	...	.	...	x
,, bimucronatus, *Nich.* Ann. Mag. Nat. His., 1869. Pl. XI. .	,, 23	...	...	...	r	...	...	...	r	...	...	x
GLOSSOGRAPTUS, *Emmons.*												
,, Hincksii, *Hopk.* Geo. Mag., 1872. Pl. XII.	,, 24	...	r	...	...	...	...	r	...	...	x	x
LASIOGRAPTUS, *Lapworth.*												
,, Harknessi, *Nich.* Trans. Edin. Geo. Soc., Vol. I. Pl. II. ...	,, 26	...	...	...	v r	..	...	...	...	...	x	...
,, *margaritatus, *Lapw.* Catl. Western Scott. Fossils. Pl. II.. fig. 60 ...	,, 25	...	...	...	...	...	...	...	...	...	x	...
CLATHROGRAPTUS, *Lapworth.*												
,, cuneiformis, *Lapw.* Geo. Mag., 1873, p. 559	,, 27	...	...	..	...	...	...	v r	...	.	...	x
RETIOLITES, *Barrande.*												
,, fibratus, *Lapw.* Catl. Western Scott. Fossils. Pl. III., fig. 62 ...	,, 28	...	...	...	v r	...	...	...	...	...	x	...
,, perlatus, *Nich.* Q.J.G.S., Vol. XXIV. Pl. XIX.			v r	..	...	...	...	...	...	x	...	...
,, ,, *var.* Daironi. *Lapw.* var. nov.	,, 30	...	v r	...	..	...	...	...	...	x	..	...
,, ,, ,, *obesus. *Lapw.* Rept. Brit. Assoc., 1871.	,, 29	...	...	...	...	...	...	...	...	x	...	...
CLIMACOGRAPTUS, *Hall.*												
,, scalaris, *His.* (non Linnæus.) Lethea Suecica, p. 113		...	c	...	...	...	...	...	...	x	...	...
,, *var. a* tectus, *Barr.* Grapt. de Boheme. Pl. I.... ...		...	...	...	...	...	...	..	...	...	...	...
,, ,, ,, *b* normalis, *Lapw.* var. nov.	,, 31	...	v c	...	...	...	...	...	...	x	...	..
,, ,, ,, *c rectangularis, *M'Coy.* Brit. Palæo. Fossils. Pl. II. ...	,, 32	...	...	...	...	...	...	...	...	x	...	..
,, ,, ,, *d caudatus, *Lapw.* Catl. Western Scott. Fossils. Pl. II.	,, 34	...	...	...	..	...	...	...	...	...	x	...
,, ,, ,, *e tubuliferus, *Lapw.* Catl. Western Scott. Fossils. Pl. II.	,, 33	...	...	...	r	...	...	...	...	...	x	...
,, Scharenbergi, *Lapw.* Catl. Western Scott. Fossils, Pl. II. ...	,, 36	...	v r	...	...	...	...	v r	...	...	x	x
,, bicornis, *Hall.* Grapt. Quebec Group. Pl. A	,, 38*a*	...	...	...	...	..	...	v r	...	...	x	x
,, ,, *var. b* tridentatus, *Lapw.* Catl. Western Scott. Fossils. Pl. II.	,, 38*c*	...	...	...	...	...	...	v r	...	...	x	x
,, ,, ,, *c* peltifer, *Lapw.* Catl. Western Scott. Fossils. Pl. II.	,, 38*b*	...	v r	...	...	...	...	v r	...	...	...	x
,, cœlatus, *Lapw.* Q.J.G.S. Vol. XXXI. Pl. XXXV.	,, 39	...	r	...	...	...	...	c	...	...	...	x
,, *Wilsoni, *Lapw.* Catl. Western Scott. Fossils. Pl. II.	,, 40	...	...	...	...	...	...	...	...	...	x.	...
,, per-excavatus, *Lapw.* Catl. Western Scott. Fossils. Pl. II. ...	,, 35	...	...	..	...	...	...	c	...	...	...	x
,, innotatus, *Nich.* Ann. Mag. Nat. His., 1869. Pl. XI.	,, 37	...	v r	...	...	...	...		...	x	...	...
DICRANOGRAPTUS, *Hall.*												
,, ramosus, *Hall.* Grapt. Quebec Group. Pl. A.	VII. 1	...	..	..	...	...	r	r	r	...	x	x
,, Nicholsoni, *Hopk.* Geo. Mag., 1870. Pl. XVI.	,, 2	...	...	...	...	...	...	r	r	...	x	x
,, formosus, *Hopk.* Geo. Mag., 1870. Pl. XVI.	VI. 41	...	r?	...	...	...	...	r	r	...	...	x
,, *Clingani, *Carr.* Geo. Mag., 1868. Pl. V.	,, 43	...	...	...	...	...	...	...	...	...	x	...
,, *ziczac, *Lapw.* Catl. Western Scott. Fossils. Pl. III.	,, 42*a*	...	...	...	...	...	...	...	...	...	...	x
,, ,, *var.* minimus, *Lapw.* Catl. Western Scott. Fossils. Pl. II. ...	,, 42*b*	..	v r	...	...	...	...	...	...	...	...	x
DICELLOGRAPTUS, *Hopkinson.*												
,, elegans, *Carr.* Geo. Mag., 1868. Pl. V.	VII. 8	...	r	...	...	...	v r	...	v r	...	x	...
,, Forchammeri, *Geinitz.* Die Graptolithen, Taf. V.	,, 7	...	r	...	r	...	...	...	r	...	x	...
,, Moffatensis, *Carr.* Ann. Mag. Nat. His., 1859	,, 9	...	...	...	...	...	...	r	...	...	x	x
,, ,, *var.* divaricatus, *Hall.* Grapt. Quebec Group, p. 13 ...	,, 10	...	...	...	...	...	...	r	...	...	..	x
,, ,, ,, *caduceus, *Lapw,* Catl. Western Scott. Fossils. Pl. IV.	,, 3	...	...	...	...	...	...	...	...	...	x	...
,, sextans, *Hall.* Palæo. New York, Vol. I. Pl. LXXVIII. ...	,, 4	...	...	...	...	...	...	...	r	...	x	x
,, *anceps, *Nich.* Geo. Mag., 1867. Pl. VII.	,, 5	...	...	...	...	...	...	...	...	x	...	...
,, *Morrisii, *Hopk.*	,, 6	...	...	...	...	...	...	...	...	...	...	...
DIDYMOGRAPTUS, *M'Coy.*												
,, superstis, *Lapw.* Catl. Western Scott. Fossils. Pl. III. ...	,, 15	..	...	...	...	...	...	r	r	...	...	x
LEPTOGRAPTUS, *Lapworth.*												
,, flaccidus, *Hall. Sp.* Grapt. Quebec Group. Pl. II.	,, 14	...	...	...	c	c	...	r	...	...	x	x
CŒNOGRAPTUS, *Hall.* (modified.)												
,, gracilis, *Hall.* Palæo. New York, Vol. I. Pl. LXXIV. ...	,, 11	...	...	...	...	...	...	c	r	...	...	x
,, surcularis, *Hall.* 20th Rept. Geo. New York, 1870	,, 12	...	...	...	...	...	...	v r	...	...	...	x
,, pertenuis, *Lapw.* Catl. Western Scott. Fossils. Pl. III. ...	,, 13	...	...	...	...	...	...	v r	...	...	...	x
THAMNOGRAPTUS, *Hall.*												
,, typus, *Hall.* Grapt. Quebec Group, p. 17	,, 16	...	...	...	...	...	...	v r	r	...	...	x
DICTYONEMA, *Hall.*												
,, Moffatensis, *Lapw* Catl. Western Scott. Fossils. Pl. IV. ...	,, 17	...	...	...	r	...	...	...	...	...	x	x
CORYNOIDES, *Nicholson.*												
,, calicularis, *Nich.* Geo. Mag., 1867. Pl. VII.	,, 18	...	r	...	...	...	...	r	r	...	x	x
,, curtus, *Lapw.* Catl. Western Scott. Fossils. Pl. IV.	,, 19	...	r	...	...	...	...	r	r	...	x	...
BRACHIOPODA, &c.												
DISCINA, *Lamarck.*												
,, Portlocki, *Geinitz.* Die Graptolithen, Taf. 1.	,, 22	...	...	...	...	...	...	v r	...	...	x	x
ACROTRETA, *Davidson.*												
,, Nicholsoni, *Dav.* Geo. Mag., 1868. Pl. XVI.	,, 21	...	v r	...	...	...	...	...	...	...	x	...
ACROTHELE, *Linnarsson.*												
,, granulata, ? *Linrs.* Afdrag. ur. Geol. Stockholm, 1877	,, 20	...	v r	...	...	...	...	...	...	...	...	x
CRUSTACEA, &c.												
DAWSONIA, *Nicholson.*												
,, campanulata. *Nich.* Ann. Mag. Nat. His., 1873	,, 23	...	c	...	...	...	...	...	...	x	...	...
DISCINOCARIS, *Hy. Woodward.*												
,, Browniana, *Hy. Woodw.* Q.J.G.S., Vol. XXII. Pl. XXV. ...	,, 25	...	r	...	...	...	...	...	...	x	...	...
PELTOCARIS, *Salter.*												
,, aptychoides, *Salter.* Q.J.G.S., Vol. VIII., p. 391	,, 24	r	v r	...	...	...	...	...	...	x	...	...
PLANTÆ.												
BUTHOTREPHIS, *Hall*												
,, *sp.*	,,	...	...	...	...	v r		...	...	...	...	..

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they are certainly subsequent to the deposition of the Silurians, which have been forced up and highly metamorphosed by them. The north-western boundary of the Silurian area has been subjected to the greatest amount of upheaval, and as denudation has reduced all to a somewhat uniform elevation, the lowest beds are here consequently most exposed. The Ballygrot beds form the axis of what was the most north-westerly anticlinal, the black shales of Crawfordsburn, Carnalea, and Orlock Point possibly represent waves of minor importance; while that at Coalpit Bay seems to have been one of considerable elevation.

Southward of this no exposures of the underlying shales are seen in Down; on the contrary, they and the overlying grits and conglomerates sink into a trough and are covered by higher beds at Portaferry in which the dark fossiliferous shales of Tieveshilly occur. Still further south, near Ardee, in County Louth, the underlying beds again come to the surface, the black Graptolite shales of the Hartfell series being well represented, in association with arenaceous bands containing other fossils of Bala or Caradoc age.

The foregoing exposition of the Silurian rocks of the County Down has been very much facilitated by the aid so kindly afforded by Charles Lapworth, Esq., F.G.S., of St. Andrews, who undertook the revision of the Graptolithina of our rocks; to his acuteness and critical judgment it is owing that our list of species is so extensive, many of the forms would otherwise have escaped detection. The monograph, with figures of the Graptolites of the County Down, which accompanies this paper is the most complete hitherto published in Britain, and I cheerfully acknowledge the obligations under which Irish geologists are placed for this synopsis of a most difficult group of fossils.

Through the kindness of William Bullock, Esq., of Donaghadee, I have had access to the fine collection of Coalpit Bay fossils, made by his father the late William Bullock, Esq. In addition to enriching my collection with a number of good specimens, Mr. Bullock has also placed a valuable series from the above locality in the Belfast Museum. The set has been completed, as far as possible, by a selection from my own collection, embracing forms representing the various beds, and including several type specimens, all of which will be available for future reference.

G. I.

G. L. L.

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ON

THE GRAPTOLITES OF COUNTY DOWN.

By CHARLES LAPWORTH, F.G.S.

The Graptolites discovered by Mr. Swanston in the black carbonaceous shales among the Silurian rocks of County Down constitute a very distinct assemblage, which is identical with that afforded by the Graptolitic bands forming the well-known *Moffat Series* of the south of Scotland. In Scotland the containing deposits have already furnished sufficient stratigraphical and palæontological evidences to allow of the determination of their natural divisions and subdivisions, and of their precise systematic position in the general succession of Silurian deposits. The black shales of County Down, however, are so excessively convoluted and shattered, that as yet it has not been found possible to fix either their total thickness or the characteristics of their component zones. That the general grouping of the beds among them is essentially similar to, if not identical with that of the Moffat Series, may nevertheless be regarded as certain. Exactly as in South Scotland, certain special forms are invariably found in association, while the proportion of the species, and the lithological features of the containing beds, are absolutely identical with those of the corresponding zones of the Moffat Series. It is possible that in the future, local stratigraphical testimony respecting the inter-relations of the various beds may be detected; but the sequence of the different fossil groups in the South of Scotland is so clear, that beyond demonstrating their identity with those of the Moffat Rocks, this would add but little to our present knowledge.

The Coalpit Bay Division of the County Down Silurians has yielded all the Graptolites of the Birkhill shales, with the exception of one special group, viz., that of the *Rastrites maximus* zone, which lies at the very summit of the Moffat

series. This circumstance is very naturally accounted for. The black shale zones of the Moffat series die out one by one, from above, as we pass outward to the north-west, from the typical Moffat area. From this cause the *Rastrites maximus* is not present in Wigtonshire, and is consequently missing also from the Black shales of the northern part of County Down, which are actually the south-westerly extension of the Wigtonshire Silurians. Should the black shales be detected in the future in the southern districts of the County Down, the *maximus* zone will probably be found occupying its natural position immediately below the greywackes.

The Hartfell shales are as yet less perfectly represented. The Barren Mudstones of the Upper Hartfell are seen in Coalpit Bay; and a striking proof of the perfect identity of these beds is afforded by the fact that they exhibit the peculiar fossil-bearing seam occasionally visible in the Moffat area. The association of fossils, their state of preservation, and the mineralogical character of the seam, are precisely identical with those of this persistent seam in Scotland. The zone at the summit of the Hartfell shales—viz., the zone of *Dicellograptus anceps* (Nich.) has not yet been discovered. Neither has any trace been found of the prolific zone of *Pleurograptus linearis*. The typical, or *Dicranograptus Clingani* zone, is indeed the only portion of the Lower Hartfell whose existence in these deposits has been fully established.

The upper, or fossiliferous portion of the Glenkiln shales, is present at Ballygrot (Greypoint), and in the section in Coalpit Bay. All its chief characteristic fossils have been already collected from these localities.

The fossils of the overlying sheet of Greywackes and flagstones are those of the great Greywacke (Gala or Valentian) group of the South of Scotland. They point to a comparatively high place in this group. The association is such as we might expect in the Hawick Rocks, which lie at the summit of the Middle Silurians of the South of Scotland, but which have not hitherto afforded any determinable species of Graptolithina.

The forms common to Ireland and Scotland may be seen on an inspection of the table (p. 124), where the range of the Irish species in the typical Scottish series is given.

The Irish species of Graptolithina, though generally in a fair state of preservation, are usually fragmentary; and the figuring of even the best specimens of the various forms would give a very inadequate idea of their characteristic appearance. As they are precisely identical in every respect with the Scotch forms, I have thought it best to figure some of the more perfect examples of the forms occurring in the County Down from my own collection, which has

been almost wholly derived from the equivalent black shales of the Moffat series. Several of these have already been figured by myself in the "Catalogue of the Western Scottish Fossils," issued under the auspices of the British Association (Glasgow, 1876).

To such species or varieties as are yet undescribed a brief diagnosis is here appended.

Genus I. RASTRITES, Barrande. (Grapt. de Boheme. Pl. 4.)

According to Herr Richter, the thecæ in this genus are mere orifices in the periderm of the common canal, and the long isolated and perpendicular tubes are simply ornamental or defensive extensions of the test. (1.) The British specimens which have hitherto come under my notice have afforded no support whatever to this opinion.

Mr. W. Carruthers figures a magnificent example of *Monograptus spiralis* (Geinitz), (2) of which a well-marked example of *Rastrites peregrinus* (Barr.) seems to form the initial portion, and to be organically connected with it. I have recently examined the specimens from which the figure was taken, and I am inclined to believe that this appearance is owing to the accidental juxtaposition of the two forms.

1. Sp. 1. *Rastrites peregrinus.* Barr, Plate 5, fig. 1.

The typical form of this well-known species is abundant in the dark shales of Coalpit Bay, a locality which has yielded the only specimens known to me in which the virgula is apparent as a distinct structure. (3). Locality—Coalpit Bay.

2. Var. *hybridus.* Lapw. Plate 5, fig. 2.

This variety is possibly identical with the fragmentary form *Rastrites fugax* of Barrande. (Grapt. de Boheme. Pl. 4.) Locality—Coalpit Bay.

Genus II. MONOGRAPTUS, Geinitz. Restricted. (Die Graptolithen, p. 32.)

3. Sp. 1. *Monograptus triangulatus.* Hark. Pl. 5, fig. 14. Locality—Coalpit Bay and Tullygarvan.

(1.) Richter. Aus die Thuringe Gebirge, Zeit. der Deutsch Gesellschaft, 1871.
(2.) Carruthers. Geological Magazine, 1868. Pl. 5, fig. 1.
(3.) Geological Magazine, 1876. Pl. 10, fig. 1.

4. Sp. 2. *Monograptus spiralis.* Geinitz. (Leon & Bronn, Jahrbuch, für. Min. 1842. Pl. 10.) Pl. 5, fig. 12.

This species is usually identified with *Prionotus convolutus* of Hisinger, but according to Dr. Linnarsson (1.) the latter was originally founded upon a specimen of *Rastrites peregrinus* (Barr.). Locality—Tieveshilly.

5. Var. *(a). fimbriatus.* Nich. Pl. 5, fig 17. Locality—Coalpit Bay.

6. Var. *(b). communis.* Lapw. Pl. 5, fig. 16.

The two preceding forms are certainly most intimately allied. The latter has an extended range, and varies much in the forms of the polypary and hydrothecæ, and seems to pass into the following form, *M. fimbriatus*, on the other hand, is very local in its distribution, and constant in its general features. Locality—Coalpit Bay.

7. Var *(c). proteus* (?). Barr. Pl. 5, fig. 18.

It is doubtful if this form is actually identical with Barrande's species. His figures remind one rather of *M. crispus* (Lapw.); and the group typified by *M. lobiferus* (M'Coy). Locality—Coalpit Bay.

8. Sp. 3. *Monograptus Sedgwicki.* Portl. Pl. 5, fig. 15. Locality—Coalpit Bay.

9. Sp. 4. *Monograptus turriculatus.* Barr. Pl. 5, fig. 11.

As in South Scotland, the majority of the specimens of this species in the beds of County Down are of very diminutive size. Locality—Tieveshilly.

10. Sp. 5. *Monograptus crispus.* Lapw. Pl. 5, fig. 13. Locality—Tieveshilly.

11. Sp. 6. *Monograptus exiguus.* Nich. Pl. 5, fig 9. Locality—Tieveshilly.

12. Sp. 7. *Monograptus Barrandei.* Suess. Pl. 5, fig. 21. Locality—Tieveshilly.

13. Sp. 8. *Monograptus runcinatus.* Lapw. Pl. 5, fig. 7. Locality—Tieveshilly.

(1.) Linnarsson. Afdreg ur Geologiska Foreningens i Stockholm Forhandlingar, 1877. No 40. Band III. No. 12.

14. Sp. 9. *Monograptus lobiferus.* M'Coy. Pl. 5, fig. 6.

This species occurs in the black shales of Coalpit Bay in a few of the common varieties, in all of which the extremity of each theca seems to form a rounded lobe, the aperture being apparently directed partly inward and partly upward against the lower wall of the central portion of the tube. According to Dr. Linnarsson, who has found specimens of this species in the *lobiferus* schists of Sweden, preserved in relief, the hydrotheca is actually coiled obliquely, and thus the aperture opens outward in a different plane to that of the proximal portion of the theca, which is wholly free. Locality—Coalpit Bay.

In the grey schists of Tieveshilly this species appears to be represented by the following form :—

15. Var. *pandus.* Lapw. Var. nov. Pl. 6, fig. 3.

Polypary simple, monoprionidian, stout, straight ; from four to six inches in length, and with an average diameter of ¼ of an inch in the fully developed portion, inclusive of the projection of the hydrothecæ. These are arranged in the proportion of from 24 to 28 to the inch, and are in contact only. They are broad at their origin, and have the superior margin almost horizontal. They narrow rapidly towards their outer extremity, which is bent downwards in the direction of the proximal extremity of the polypary.

This form has been frequently noticed by palæontologists, but its distinctness has not hitherto been acknowledged. Barrande (Grapt. de Boheme. Pl. 1, figs. 10 to 14) and Geinitz (Die Graptolithen, Taf. III, figs. 24, 25, &c.) both refer it to *Monograptus priodon.* (Bronn). From that species, however, it is easily distinguished by the general form of the theca, and the absence of overlap. From *Monograptus Clingani* (Carr.) it differs in the size and shape of the polypary. Locality—Tieveshilly.

16. Sp. 10. *Monograptus priodon.* Bronn. Pl. 5, figs. 24a, and 24b. Locality—Tieveshilly.

17. Sp. 11. *Monograptus Riccartonensis.* Lapw. Pl. 5, fig. 23. Locality—Tieveshilly.

18. Sp. 12. *Monograptus Galaensis.* Lapw. Pl. 6, fig. 1. Locality—Tieveshilly.

The two preceding species are found in association at Tieveshilly. In Scotland the former appears to be restricted to the *Riccarton Beds* (Wenlock); and the latter occurs only in the *Gala Group* (Llandovery).

19. Sp. 13. *Monograptus M'Coyi.* Lapw. Sp. nov. Pl. 6, fig. 2.

Polypary simple, monoprionidian, straight, several inches in length, and with an average width of one-sixth of an inch. Hydrothecæ about 30 to the inch, in contact throughout the whole of their extent, inclined at an angle of 45°; of the general form of slender quadrangular tubes, about five times longer than broad; apertural margin convex, expanded into an oblique, blunt, triangular denticle. (Loc. Builth Bridge, Radnor.)

The foregoing diagnosis has been drawn up from M'Coy's figure and description of a form from the Silurian Rocks of Wales (Palæozoic Rocks and Fossils. Pl. 1 B, fig 7, and p. 4) (1.) which he erroneously identified with his *Graptolithus latus*, originally founded upon a fragment of a Dichograptidian species, from the Skiddaw Slates of the Lake District (Quart. Journal Geol. Society, vol. 4, p, 223). Locality—A single well-preserved fragment only has been obtained from the Llandovery beds of Tieveshilly.

20. Sp. 14. *Monograptus Hisingeri.* Carr. (See Geo. Mag., 1868. Pl. 12, fig. 1.)

(a). Typical form. Locality—Tieveshilly.

21. *(b).* Var. *jaculum.* Lapw. Pl. 5, fig. 20. Localities—Coalpit Bay and Tullygarvan.

22. Sp. 15. *Monograptus cyphus.* Lapw. Pl. 5, fig. 25. Localities—Coalpit Bay and Tullygarvan.

23. Sp. 16. *Monograptus leptotheca.* Lapw, Pl. 5, fig. 22. Locality—Some doubtful fragments only of this species have been collected from the black shales of Coalpit Bay.

24. Sp. 17. *Monograptus concinnus.* Lapw. Pl. 5, fig. 19. Locality—Coalpit Bay.

(1.) Compare Römer in Leon and Bronn, Jahrbuch f Min., 1855. p. 541, plate 8, fig. 2.

25. Sp. 18. *Monograptus gregarius.* Lapw. Pl. 5, fig. 4. Locality—The characteristic fossil of the central portion of the Birkhill shales. It occurs in myriads in the black shales of Coalpit Bay.

26. Sp. 19. *Monograptus argutus.* Lapw. Pl. 5, fig. 5.

The accompanying figure, as well as that illustrative of the original description of this species, was taken from a cast of a compressed example. In specimens preserved with their relief the hydrothecæ resemble those in *Dicellograptus*, having a deep excavation in the distal portion of their outer wall, while the aperture opens obliquely outwards, partly overlapping the lateral wall of the common canal. Locality—Coalpit Bay.

27. Sp. 20. *Monograptus Sandersoni.* Lapw. Pl. 5, fig. 8. Localities—Coalpit Bay and Tullygarvan.

28. Sp. 21. *Monograptus tenuis.* Portlock. Pl. 5, fig. 10. Localities—Coalpit Bay and Tullygarvan (?)

29. Sp. 22. *Monograptus attenuatus.* Hopk. Pl. 5, fig. 3. Locality—Coalpit Bay.

Genus III. DIMORPHOGRAPTUS, provisional genus. Lapworth. (Geo. Mag., 1876, p. 545.)

Examples of this genus are found in great profusion both in Ireland and Scotland, and in all we find the characteristic mono-diprionidian polypary. Nevertheless, in the complete absence of specimens preserved in relief, I have grave doubts of the validity of the genus. We meet with occasional examples in which we have a hint of a second series of hydrothecæ in the proximal portion. It is just possible that in this group the concavo-convexity of the polypary general among the diprionidian Graptolites is carried to excess; and that the partial invisibility of the second series of hydrothecæ is due to their lying almost parallel with those of the first series.

30. Sp. 1. *Dimorphograptus Swanstoni.* Lapw. Pl. 6, fig. 5.

A most remarkable and very distinct little species. It occurs in admirable preservation in the Coalpit Bay division of the County Down black shales, but has not hitherto been detected in the corresponding zone of the Moffat Series. Geinitz figures an example of this species from the *Kiesel-scheifer* of Central Germany. (Die Versteinerungen, Taf. 1, fig. 25.) Locality—Coalpit Bay.

31. Sp. 2. *Dimorphograptus elongatus.* Lapw. Pl. 6, fig. 6. Locality—Coalpit Bay.

Genus IV. CEPHALOGRAPTUS. Hopkinson. (Journal Quekett Micros. Club, 1869.)

32. Sp. 1. *Cephalograptus cometa.* Geinitz. Pl. 6, fig. 4. Locality—Coalpit Bay.

Genus V. DIPLOGRAPTUS. M'Coy. (Annals and Mag. Nat. His.).

In addition to the diprionidian form of the polypary, the chief characteristic of this genus is generally held to be the fact that the central canal is divided longitudinally, by a vertical septum or diaphragm, into two distinct portions which do not communicate with each other—at least in the later stages of the growth of the polypary. In one group, however—viz., the sub-genus *Glyptograptus* (Lapw.)—none of the examples preserved with their relief which have hitherto come under my notice, give evidence of the presence of this diaphragm; but, on the other hand, the cœnosarcal tube appears to be undivided, and to be in organic connection with both series of hydrothecæ, as in *Retiolites.*

33. Sp. 1. *Diplograptus acuminatus.* Nich. Pl. 6, fig. 7.

The characteristic fossil of the lowest zone of the Llandoveries of South Scotland. It is as yet unknown in Ireland.

34. Sp. 2. *Diplograptus modestus.* Lapw. Pl. 6, fig. 8. (Catl. Western Scott. Fossils. Plate 2, fig. 33.) Locality—Coalpit Bay.

35. Sp. 3. *Diplograptus sinuatus.* Nich. Pl. 6, fig. 9. Locality—Coalpit Bay.

36. Sp. 4. *Diplograptus tricornis.* Carr. Pl. 6, fig. 10. Localities—Coalpit Bay, Ballygrot, and Craigavad.

37. Sp. 5. *Diplograptus angustifolius.* Hall. Pl. 6, fig. 11. Localities—Coalpit Bay and Ballygrot.

38. Sp. 6. *Diplograptus tamariscus.* Nich. Pl. 6, fig. 12. Locality—Coalpit Bay.

39. Sp. 7. *Diplograptus dentatus.* Brongn. Pl. 6, fig. 13. Locality—Ballygrot.

40. Sp. 8. *Diplograptus Hughesi.* Nich. Pl. 6, fig. 14. Locality– Coalpit Bay.

41. Sp. 9. *Diplograptus insectiformis.* Nich. Pl. 6, fig. 15. Locality—Ballygrot.

42. Sp. 10. *Diplograptus folium.* His. Pl. 6, fig. 16. Locality—Coalpit Bay.

43. Sp. 11. *Diplograptus truncatus.* Lapw. Pl. 6, fig. 17, *Diplograptus pristis*, var. *truncatus.* Lapw. (Catl. Western Scott, Fossils. Plate 1, fig. 28.)

Polypary diprionidian, sub-fusiform or with parallel margins, one to three inches in length and one-eighth of an inch in maximum diameter; furnished proximally with a minute radicle and lateral spines. Virgula invisible. Hydrothecæ inclined at an angle of about 45 degrees, linear-tubular, expanding towards the oblique apertural margin and ornamented with minute transverse striæ.

There are several varieties of this species in the South Scottish rocks, but they agree generally in the foregoing characteristics. Some smaller and wider examples of this form are almost inseparable from *Dip. palmeus.* Forms preserved in relief show no trace of a longitudinal septum on one of the lateral faces. I formerly referred this species to *Diplograptus pristis* of Hisinger, but Swedish specimens of the latter show a polypary and hydrothecæ of the general type of *Diplograptus quadrimucronatus* (Hall).

44. Sp. 12. *Diplograptus foliaceus.* Murch. Pl. 6, fig. 18. Locality—Ballygrot.

45. Sp 13. *Diplograptus vesiculosus.* Nich. Pl. 6, fig. 19. Locality—Coalpit Bay.

46. Sp. 14. *Diplograptus quadrimucronatus.* Hall. Pl. 6, fig. 20.

In the Scottish examples referred to this species, four rigid spurs are usually given off, one from each of the angles of the prismoid polypary at a normally uniform height corresponding to the position of the sixth or seventh hydrotheca, counting from the initial extremity.

In the Irish forms collected by Mr. Swanston the spurs are sometimes

regularly disposed in two opposite series, and sometimes irregularly scattered along the extent of the outer margin of the polypary.

These forms are all certainly allied to *Glossograptus*, but our present evidences are insufficient to justify their removal to that genus. Locality—Carnalea.

47. Sp. 15. *Diplograptus Whitfieldi*. Hall. Pl. 6, fig. 21.

The interesting examples furnished with lateral reproductive appendages, figured by Hall in his Graptolites of the Quebec group, Plate B, and assigned by him to the present species, are clearly distinct. It is most probable that they belong to a form of *Lasiograptus* (?) resembling *Lasiograptus bimucronatus*, Nich. Locality—Carnalea.

48. Sp. 16. *Diplograptus (Lasiograptus ?) mucronatus*. Hall. Pl. 6, fig. 22.

In this series the apertural fibres occasionally anastomose; and examples with lateral reproductive appendages are not infrequent in the Moffat Series in Scotland. In Ireland the species is as yet unknown.

49. Sp. 17. *Diplograptus (Hallograptus) bimucronatus*. Nich. Pl. 6, fig. 23.

It is in this species that the lateral reproductive processes are most frequently met with in British Rocks. Few examples of this form occur which appear wholly destitute of them, or of the lateral fibres which support them. Mr. W. Carruthers has suggested that this form, and the very similar *Diplograptus mucronatus* should be erected into a new genus under the title of *Hallograptus*, in honour of the eminent palæontologist, who was the first to figure these forms and to suggest the possible function of their remarkable appendages.

Genus VI. GLOSSOGRAPTUS. Emmons.

50. Sp. 1. *Glossograptus Hincksii*. Hopk. Pl. 6, fig. 24.

The lateral appendages in this species and genus differ from those in *Hallograptus*, in being rigid blind spurs comparable with those at the proximal extremity of *Climacograptus bicornis* (Hall). In all the supposed species of this genus, the apertural spines are also remarkably stout and rigid, but they never anastomose as in the older and very closely allied genus *Retiograptus* of Hall. (Grapt. Quebec Group, Plate 16, figs. 6 to 8). *Glossograptus ciliatus*, Emmons (American Geol., vol. 1, plate 1, fig 25); *Glossograptus setaceus*, Ibid. Fig.

20; *Diplograptus ciliatus*, Ibid. Fig. 19; *Diplograptus spinulosus*, Hall. *Diplograptus fimbriatus*, Hopk. (Geol. Mag., 1872. Pl. 12, fig. 8.) *Diplograptus pinguis*, Ibid. Fig. 7; all belong to this genus and will probably prove to have been founded on either one or two distinct species: the aspect of the polypary varying to an extraordinary degree according to the direction in which the compression has been effected. Localities--Coalpit Bay and Ballygrot.

Genus VII. LASIOGRAPTUS. Lapworth

51. Sp. 1. *Lasiograptus Harknessi*. Nich. Pl. 6, fig. 26.

An examination of Nicholson's type specimen of his *Diplograptus Harknessi* has convinced me that it is identical with my *Lasiograptus costatus*, which must consequently be suppressed. This species has a great range in the Moffat Series, passing upwards from its very lowest beds into the middle of the Hartfell Shales. Occasionally a specimen is detected in which the ventral spines are rudimentary and do not anastomose. Locality—Carnalea.

52. Sp. 2. *Lasiograptus margaritatus* Lapw. Pl. 6, fig. 25.

Polypary diprionidian, about one inch in length and about one-eighth of an inch in diameter, inclusive of the marginal net-work. Virgula capillary, just visible beyond the distal margin Hydrothecæ 25 to 30 to the inch, free, triangular in form, with long-pointed denticles which are developed horizontally outwards as distinct filaments to a distance equal to the width of the central portion of the polypary, where they are split up into several subordinate threads. These are united to those similarly derived from the hydrothecæ immediately above and below. and thus originate a continuous series of marginal meshes completely surrounding the polypary.

In this species the hydrothecæ are of the type of those of *Diplograptus mucronatus* (Hall), and the general aspect of the polypary is essentially similar to that of *Diplograptus limucronatus* (Nich.). In *Lasiograptus Harknessi* the thecæ resemple those of *Climacograptus*. Locality—Unknown in Ireland.

Genus VIII. CLATHROGRAPTUS. Lapworth.

53. Sp. 1. *Clathrograptus cuneiformis*. Lapw. Pl. 6, fig. 27.

The figure shows merely the skeleton framework of the polypary. In well

preserved specimens this skeleton is covered and partially hidden from sight by a thin continuous membrane showing cell-apertures. Locality—Ballygrot.

The genus *Retiograptus* of Hall included three distinct genera. The title of *Retiograptus* is best restricted to the forms to which it was first applied, viz., those of the type *Retiograptus tentaculatus*, which combines the generic characters of *Glossograptus* and *Lasiograptus*. *Clathrograptus* embraces the simple diprionidian forms of the type of *Retiograptus Geinitzianus* (Hall, non Barrande). A third genus remains, which is typified by the extraordinary compound species *Retiograptus nucharis*, from Lake St. John.

Genus IX. RETIOLITES. Barrande.

54. Sp 1. *Retiolites fibratus*. Lapw. Pl. 6, fig. 28.

Polypary simple, diprionidian, one or two inches in length and one-fourth of an inch in breadth; margins parallel, proximal end broadly rounded and destitute of ornament. Virgula stout, straight, distally prolonged, Hydrothecæ 24 to 28 to the inch, their position being indicated by broad regularly quadrangular meshes. Epiderm continuous, supported on a skeleton framework of interlacing threads.

This form, which is remarkably abundant in the higher zones of the Lower Hartfell of South Scotland, is intimately allied to the forms here united under *Retiolites perlatus* (Nich.), but differs from them mainly in the form of the thecal meshes, and in the frequent presence of lateral appendages. Locality—Carnalea.

55. Sp. 2. *Retiolites perlatus*? Nich. (Geo. Journal, vol. xxiv., p. 530.)

The original example of this species is too imperfectly preserved to enable us to recognize any specific character beyond the great breadth of the polypary and the extraordinary width of the dermal meshes. In this respect it agrees with certain views of the two following forms which occur in the South of Scotland, but neither of which it is as yet possible to identify with the *R. perlatus* of the Coniston Mudstones.

56. Var. *Daironi*. Var. nov. Lapw. Pl. 6, fig. 30.

Occasionally three or four inches in length. In the characteristic view it resembles a gigantic specimen of *Dip. palmeus* (Barr.), with a retiform covering. In addition to this network this form must have possessed a continuous superficial membrane of sufficient thickness to

leave indubitable traces of its presence upon the matrix. Locality—Coalpit Bay.

57. Var. *obesus*. Lapw. (Rept. Brit. Assoc. 1871.) Pl. 6, fig. 29.

The special features of this form are the great size and the elegant and characteristic shape of the thecal meshes. The thecæ themelves appear almost horizontal. Locality—Unknown in Ireland; common in the Gala Group of South Scotland, and in the highest seams of the Birkhill shales.

Genus X. CLIMACOGRAPTUS. Hall. (Grapt. Quebec Group, p, 111.)

According to Professor Hall, the polypary in this genus has no central septum, and the hydrothecæ are simple openings in the outer test of a single internal cœnosarcal canal. By Professor Nicholson, on the other hand, the polypary is believed to be formed, actually or theoretically, of two monoprionidian polyparies placed back to back; their dorsal walls being flattened into a bilaminate median septum, and their virgulæ coalescing into a double central virgula. I have verified the accuracy of the latter theory in the species *Climacograptus scalaris* (His.), in several of its varieties, and in *C. Wilsoni.* (Lapw.); but if the analogy furnished by the structure of *Diplograptus* as described above, is to guide us, it is not impossible that both these interpretations are correct, each for itself, and that within the limits of *Climacograptus*, as at present received, are included some forms in which the median septum is continuous from side to side, and others in which the hydrothecæ of both series open into one and the same central cœnosarcal canal.

58. Sp. 1. *Climacograptus scalaris*. His. (Non Linnæus.) (Lethea Suecica, Plate xxxviii.)

The form figured by Linnæus as *Graptolithus scalaris*, (1) was a *Monograptus* allied to *M. colonus* of Barrande, from the Upper Silurian strata in which the genus *Climacograptus* is unknown. Examples in my possession procured from the same locality whence Linnæus obtained his species show the peculiar scalariform appearance figured by him, with great distinctness. They are also associated with unrolled examples of a spiralis like *Cyrtograptus*, as in his original drawing. Linnæus' name, *scalaris*, should be employed for the *Monograptus*, to which he originally applied it; but in the meantime it is perhaps inadvisable to disturb Hisinger's title for the Swedish *Climacograptus*. The following forms,

1 Skanska Resa., p. 147.

which are usually referred by palæontologists to this species, all agree in the possession of a tapering polypary, destitute of proximal ornamentation; perpendicular, short, square, hydrothecæ; and straight, or very gently undulating suture.

59. Var. *a. tectus.* Barrande. (Grapt. de Boheme. Pl. 1, figs. 19 and 20.)

Virgula never distally prolonged. Locality—Rare in the Gala Group of South Scotland, unknown as yet in County Down.

60. Var. *b. normalis.* Lapw. Pl. 6, fig. 31.

Polypary with sub-parallel margins. Virgula greatly prolonged distally. Locality—Abundant in Coalpit Bay.

61. Var. *c. Climacograptus rectangularis.* M'Coy. Pl. 6, fig. 32.

Virgula prolonged, proximally only, to a considerable length. Polypary tapering. Locality—Unknown in Ireland. Rare in the Birkhill Shales of Moffat.

62. Var. *d. Climacograptus caudatus.* Lapw. Pl. 6, fig. 34.

Polypary tapering, several inches in length, with stout virgula prolonged both proximally and distally to a length equal to that of the polypary itself. Locality—Unknown in Ireland.

63. Var. *e. Climacograptus tubuliferus.* Lapw. Pl. 6, fig. 33.

Polypary with parallel margins, virgula distally prolonged and expanded into a long flattened plate or vesicle. Locality—Carnalea.

In Scotland each of the foregoing forms has a definite range in the succession of Silurian deposits. They are all most certainly very intimately allied, but it is possible that we may eventually be forced to look upon them as distinct species. Such of these forms as are known upon the Continent have a corresponding vertical range, and appear to possess similar external features.

64. Sp. 2. *Climacograptus Scharenbergi.* Lapw. Pl. 6, fig. 36. (Catl. West. Scott. Fossils. Plate 2, fig. 36).

Polypary diprionidian, about an inch in length and one-twelfth of an inch in average diameter; proximal end ornamented with a short radicle

only. Suture deep, zigzag, having each angle prolonged in a short horizontal groove. Virgula distally prolonged. Hydrothecæ 28 to 36 in the space of an inch, short, perpendicular, with the distal extremity of each very slightly introverted.

The chief characteristic of this species is afforded by its remarkable sutural groove. This is distinctly angulated, running in zig-zag straight lines from side to side. From the outer point of each angulation a short horizontal groove continuous with that of the suture traverses the covering of the cœnosarcal tube almost to its outer edge.

This form has been frequently figured by palæontologists, even under its most typical aspect, but always in association with closely allied forms. (1) Its characters are so unique that there can be no hesitation in regarding it as a distinct species.

The various forms here referred to *C. Scalaris*. His. universally abound in Bala and Lower Llandovery rocks. They are unknown apparently in rocks of Llandeilo and Lower Bala age, where their place is taken by the present species, which occurs in Wales, Scotland, and Scandinavia in these ancient formations. The two forms doubtfully overlap for a short period in the *Clingani* zone of the Hartfell shales of the Moffat area. Localities—Scotland—in the Glenkiln and lowest Hartfell beds everywhere. Ireland—Ballygrot, Craigavad, and Coalpit Bay.

65. Sp. 3. *Climacograptus bicornis*. Hall. Type form. Pl. 6, fig. 38a. Locality—Ballygrot.

66. Var. *(b.) tridentatus*. Lapw. Pl. 6, fig. 38c.

67. Var. *(c.) peltifer*. Lapw. Pl. 6, fig. 38b.

68. Sp. 4. *Climacograptus cœlatus*. Lapw. Pl. 6, fig. 39.

The figure which illustrates the original description of this species (Quart. Journ. Geol. Soc., 1875, Pl. 35, fig. 8) is a very bad one. The original diagnosis should be compared with the figure on plate of the present memoir. In the Welsh specimens the hydrothecæ are more deeply divided and the

(1) Compare, for example, Böch, Bernerk aug., Graptolitherne, Taf. 1, figs. 3, 10, 15, 18. Scharenburg, Ueber Graptolithen, Taf. 2, figs. 24, 25, &c , &c. Salter Q. J. G. S., vol. viii., pl. 7, fig. 3. Torquist.

interspaces are more oblique than in the Scottish forms. Locality—Coalpit Bay and Ballygrot.

69. Sp. 5. *Climacograptus Wilsoni.* Lapw. Pl. 6, fig. 40. (Catl. Western Scottish Fossils, 1876. Pl. 2, fig. 46.)

Polypary two to four inches in length and one eighth of an inch in maximum diameter; proximal end abrupt, furnished with two short horizontal radicular processes. Septum direct. Virgula stout, distally prolonged for a distance nearly equal to the length of the polypary; and supporting proximally a large elliptical vesicle. Hydrothecæ 16 to 20 to the inch; short, square, perpendicular; excavation shallow, horizontal.

Closely allied to the foregoing and following species—Locality—Unknown in Ireland.

70. Sp. 6. *Climacograptus per-excavatus.* Lapw. Pl. 6, fig. 35.

Polypary one and a half inches in length, and about one eighth of an inch in breadth; margins parallel till close upon the proximal extremity which is broadly rounded off, and ornamented with three short, stiff, proximal spines. Virgula distally prolonged. Hydrothecæ 28 to 36 to the inch, with inclined partition walls; excavations wide and deep, occupying more than half the ventral margin of the polypary, and from one-fourth to one third of its transverse diameter. Horizon—Glenkiln shales. Localities in Scotland—Craigmichan, Glenkiln, Leadhills. In Ireland—at Ballygrot and Coalpit Bay. A most prolific species, it occurs in great abundance at the localities cited.

71. Sp. 7. *Climacograptus innotatus.* Nich. Pl. 6, fig. 37. Locality—Coalpit Bay.

Genus XI. DICRANOGRAPTUS. Hall. (Grapt. Quebec Group, p. 112.)

72. Sp. 1. *Dicranograptus ramosus.* Pl. 7, fig. 1.

The earlier or Llandeilo examples of this and the following species are remarkably spinose. As we ascend in the series of beds the spines seem to become shorter and less conspicuous. In the highest beds where these species are known they are destitute of spines. Localities—Crawfordsburn, Ballygrot, and Craigavad.

73. Sp. 2. *Dicranograptus Nicholsoni.* Hopk. Pl. 7, fig. 2. Locality—Ballygrot.

74. Sp. 3. *Dicranograptus formosus.* Hopk. Pl. 6, fig. 41. Localities—Coalpit Bay and Craigavad.

75. Sp. 4. *Dicranograptus Clingani.* Carr. Pl. 6, fig. 43. Locality—Not yet detected in Ireland.

76. Sp. 5. *Dicranograptus ziczac.* Lapw. Pl. 6, fig. 42*a*. (Catl. Western Scottish Fossils. Plate 3, fig. 77.)

Stem one-eighth of an inch in length, pointed; branches diverging at an angle of about 120 degrees, about an inch in length, bent into an elegant double curve, and forming a polypary of a vase-like form. Hydrothecæ 28 to 30 to the inch, seen in profile on the stem; invisible upon the branches. Allied to *Dicranograptus furcatus* of Hall. (Pal. New York, Vol. I. Plate 74, fig. 4.) Locality—Unknown in Ireland.

77. Var. *minimus.* Lapw. Pl. 6, fig. 42*b*.

Branches half an inch in length, forming a single gentle curve. Locality—Coalpit Bay,

Genus XII. DICELLOGRAPTUS. Hopkinson. (Geol. Mag. 1871. Pl. 1, p. 20.)

78. Sp. 1. *Dicellograptus elegans.* Carr. Pl. 7, fig. 8. Localities—Carnalea, Craigavad, and Coalpit Bay.

79. Sp. 2. *Dicellograptus Forchammeri.* Geinitz. Pl. 7, fig. 7. Localities—Carnalea, Ballygrot, and Coalpit Bay.

80. Sp. 3. *Dicellograptus Moffatensis.* Carr. Pl. 7, fig. 9. Locality—Ballygrot.

81. Var. *(a) divaricatus.* Hall. Pl. 7, fig. 10. Locality—Ballygrot.

82. Sp. 4. *Dicellograptus caduceus.* Lapw. Pl. 7, fig. 3. (Catl. Western Scottish Fossils. Pl. 4, fig. 83.)

Polypary consisting of two simple monoprionidian branches, which diverge

at a small angle, and are so curved that they cross and recross each other distally in the figure of 8. Axillary spine prominent, lateral spines undeveloped. Hydrothecæ 24 to 28 to the inch, of the form of those of *Dicellograptus elegans*, Carr. Sp. Locality—Ballygrot.

Genus XIII. DIDYMOGRAPTUS. M'Coy; (Pal. Foss., p. 9.)

83. Sp. 1. *Didymograptus superstes*. Lapw. Pl. 7, figs. 15 *a-b*. (Catl. Western Scottish Fossils. Pl. 3, fig. 74.)

Polypary consisting of two simple monoprionidian branches, of great length, attaining a maximum diameter of one-tenth of an inch, within the first three inches of their extent; broadly curved and including a ventral angle of about 120 degrees. Hydrothecæ 24 to the inch, inclined at an angle of 40 degrees, rapidly expanding in the direction of the apertural margin, which is deeply concave, and forms a broad triangular denticle.

Perfect specimens of this well-marked species are rarely detected; but the broad and slightly curved branches are numerous both in Scotland and Ireland in the typical Glenkiln Shales. This is in all probability the same species as that figured by Hall as *Graptolethus sagittarius*. (Pal. New York. Vol. I., Plate 74, fig. 1.) It is also associated here, as in North America, with a slender species which appears to be the same as *Didymograptus serratulus* (Hall). Localities—Ballygrot and Craigavad.

Genus XIV. LEPTOGRAPTUS. Lapworth. (Geol. Mag. 1873, p. 558.)

84. Sp. 1. *Leptograptus flaccidus*. Hall. Pl. 7, fig. 14. Localities—Carnalea, Orlock Point, and Ballygrot.

Genus XV. CŒNOGRAPTUS. Hall. (Modified.) (Hall, Annual Report, 1867, p. 179.)

So far as at present known this genus differs from *Pleurograptus* (Nich.), in the possession of an initial cross-bar, formed by the persistent sicula.

85. Sp. 1. *Cœnograptus gracilis*. Hall. Pl. 7, fig. 11. Localities—Ballygrot and Craigavad.

None of the Scottish examples of this species give evidence of having been

composed of four branches, as indicated in the American specimen figured by Hall. (Grapt. Quebec Group, p. 14.)

86. Sp. 2. *Cœnograptus surcularis*. Hall. Pl. 7, fig. 12. Locality—Ballygrot.

87. Sp. 3. *Cœnograptus pertenuis*. Lapw. Pl. 7, fig. 13. (Catl. Western Scottish Fossils, 1876. Pl. 3, figs. 66, 67.)

Polypary consisting of two simple or compound monoprionidian flexuous and extremely slender branches, proceeding in opposite directions from the central portion of a well-marked sicula. Hydrothecæ 16 to the inch, of the type of those of *Cœnograptus gracilis*,

The forms *C. explanatus*, and *C. nitidulus* figured by myself in the Catl. Western Scott. Fossils may be distinct species, or merely varieties of the present form. It will consequently be better to defer their description till this point has been satisfactorily determined. Locality—Ballygrot.

Genus XVI. THAMNOGRAPTUS. Hall.

88. Sp. 1. *Thamnograptus typus?* Hall. Pl. 7, fig. 16.

This form has only been procured in small fragments in the dark shales of County Down. It occurs locally in great profusion in the Glenkiln Beds of the South of Scotland. Some comparatively perfect and well preserved examples from these beds lately added to my collection, make it clear that different portions of the polypary are so distinct in their characters, that they have been considered as belonging to distinct species. *Rastrites Barrandei* of Hall is a true *Thamnograptus*, and ought probably to be referred to the present form. Localities—Ballygrot and Craigavad.

Genus XVII. DICTYONEMA. Hall. (Palaeontology of New York, Vol. ii., p. 174.)

89. Sp. 1. *Dictyonema Moffatensis*. Lapw. Pl. 7, fig. 17.

Polypary about an inch in length and one-third of an inch in maximum diameter, cupshaped, of an elongate semi-elliptical form; composed of slender, radiating, free, comparatively straight branches, with slightly crenulated margins; transverse dissepiments distant, scarcely visible;

Proximal portion of polypary prolonged into, and partially enveloped in a chitonous disc or plate.

All the specimens of this species known to me are in a very indifferent state of preservation, and the foregoing characters are all that can be made out with certainty. Locality—Carnalea.

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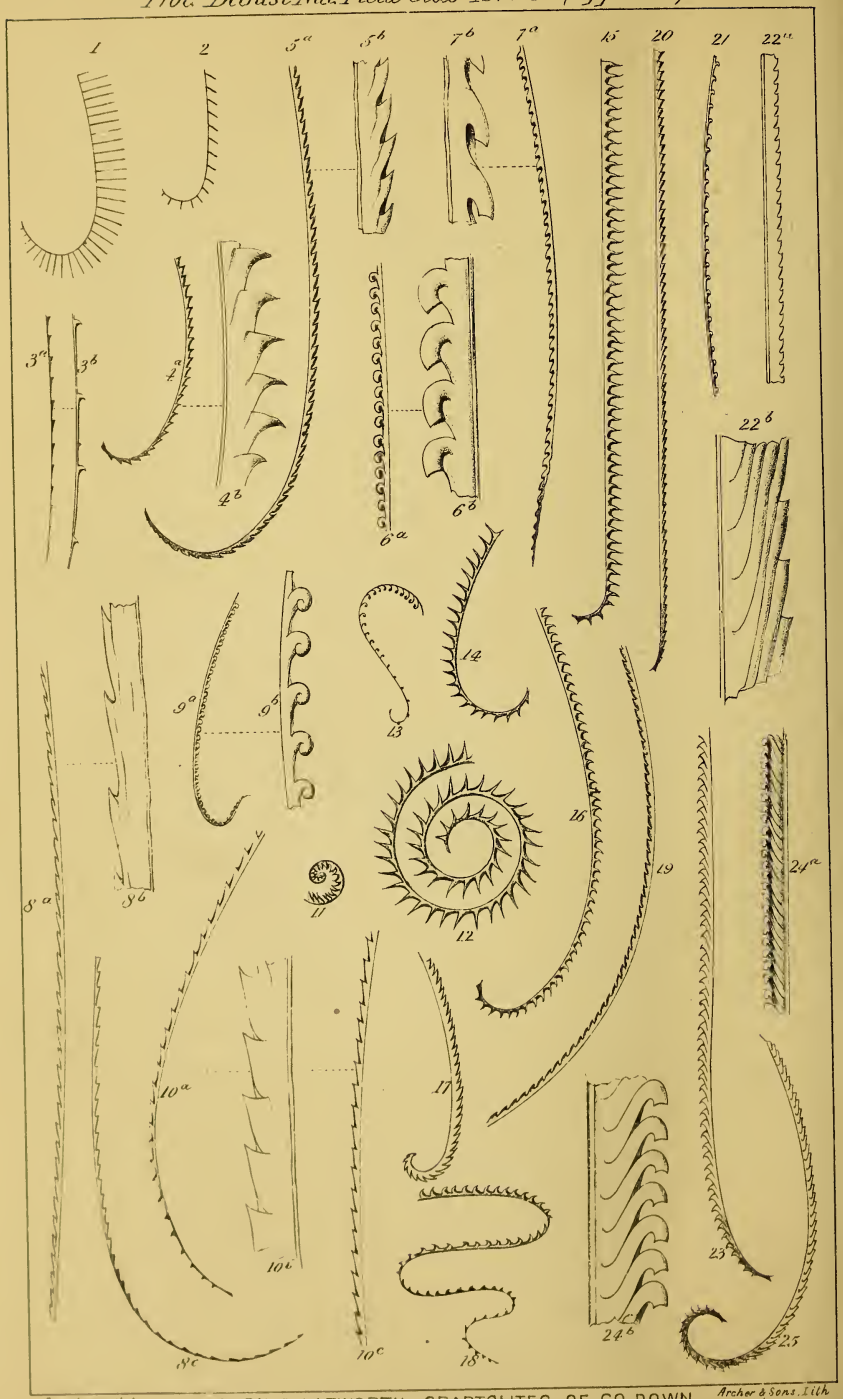

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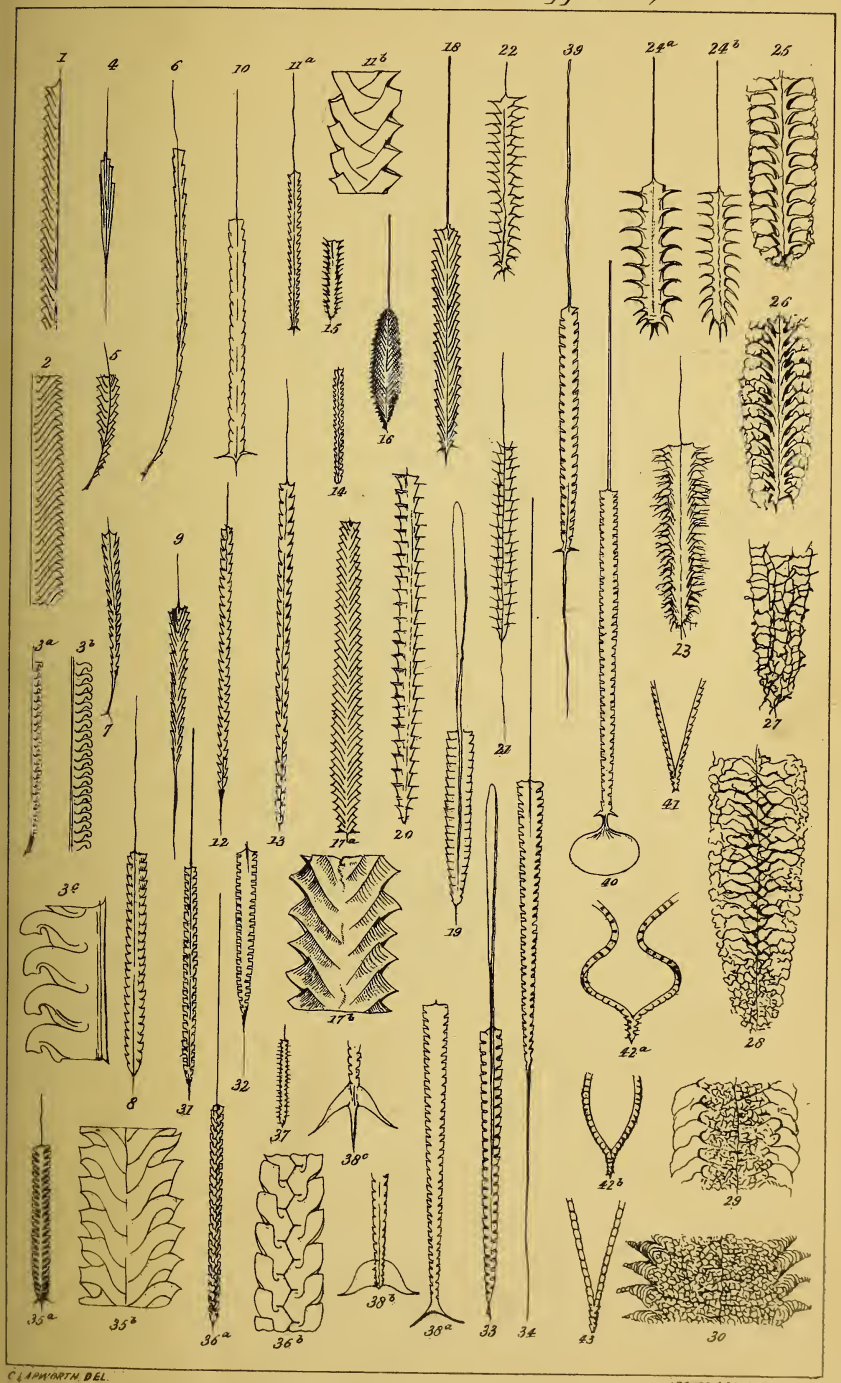
EXPLANATION OF PLATE V.

Fig. 1. *Rastrites peregrinus*, Barr.
,, 2. ,, ,, var. *hybridus*, Lapw.
,, 3. *Monograptus attenuatus*, Hopk.
,, 4*a*. ,, *gregarius*, Lapw. 4*b*, portion enlarged.
,, 5*a*. ,, *argutus*, Lapw. 5*b*, portion enlarged.
,, 6*a*. ,, *lobiferus*, M'Coy. 6*b*, portion enlarged.
,, 7*a*. ,, *runcinatus*, Lapw. 7*b*, portion enlarged.
,, 8*a*. ,, *Sandersoni*, Lapw. 8*b*, portion enlarged; 8*c*, proximal extremity.
,, 9*a*. ,, *exiguus*, Nich. 9*b*, portion enlarged.
,, 10*a*. ,, *tenuis*, Portl. (proximal extremity). 10*c*, distal extremity; 10*b*, portion enlarged.
,, 11. ,, *turriculatus*, Barr.
, 12. ,, *spiralis*, Geinitz.
,, 13. ,, *crispus*, Lapw.
, 14. ,, *triangulatus*, Harkn.
,, 15. ,, *Sedgwickii*, Portl.
,, 16. ,, *communis*, Lapw.
,, 17. ,, *fimbriatus*, Nich.
,, 18. ,, *proteus*, Barr.
,, 19. ,, *concinnus*, Lapw.
,, 20. ,, *Hisingeri*, Carr. Var. *jaculum*, Lapw.
,, 21. ,, *Barrandei*, Suess.
,, 22. ,, *leptotheca*, Lapw. 10*b*, portion enlarged.
,, 23. ,, *Riccartonensis*, Lapw.
,, 24*a*. ,, *priodon*, Brown. 24*b*, portion enlarged.
,, 25. ,, *cyphus*, Lapw.

EXPLANATION OF PLATE VI.

Fig. 1. *Monograptus Galaensis*, Lapw.
,, 2. ,, *M'Coyi*, Lapw.
,, 3*a*. ,, *lobiferus ?* M'Coy. Var. *pandus* (proximal extremity); 3*b*, distal extremity ; 3*c*, the same enlarged.
,, 4. *Cephalograptus cometa*, Geinitz.
,, 5. *Dimorphograptus Swanstoni*, Lapw.
,, 6. ,, *elongatus*, Lapw.
,, 7. *Diplograptus acuminatus*, Nich.
,, 8. ,, *confertus*, Nich.
,, 9. ,, *sinuatus*, Nich.
,, 10. ,, *tricornis*, Carr.
,, 11*a*. ,, *angustifolius*, Hall. 11*b*, portion enlarged.
,, 12. ,, *tamariscus*, Nich.
,, 13. ,, *dentatus*, Brogn.
,, 14. ,, *Hughesii*, Nich.
,, 15. ,, *insectiformis*, Nich.
,, 16. ,, *folium*, His.
,, 17*a*. ,, *truncatus*, Lapw. 17*b*, portion enlarged.
,, 18. ,, *foliaceus*, Murch.
,, 19. ,, *vesiculosus*, Nich.
,, 20. ,, *quadrimucronatus*, Hall.
,, 21. ,, *Whitfieldi*, Hall.
,, 22. ,, *mucronatus*, Hall.
,, 23. ,, *bimucronatus*, Nich.
,, 24*a*. *Glossograptus Hincksi*, Hopk. (Ventral aspect); 24*b*, lateral aspect.
,, 25. *Lasiograptus margaritatus*, Lapw. x. 2.
,, 26. ,, *Harknessi*, Nich. x. 2.
,, 27. *Clathrograptus cuneiformis*, Lapw. x. 2.
,, 28. *Retiolites fibratus*, Lapw. x. 2.
,, 29. ,, *perlatus ?* Nich. Var. *obesus*, Lapw. x. 2.
,, 30. ,, ,, Var. *Daironi*, Lapw. x. 2.



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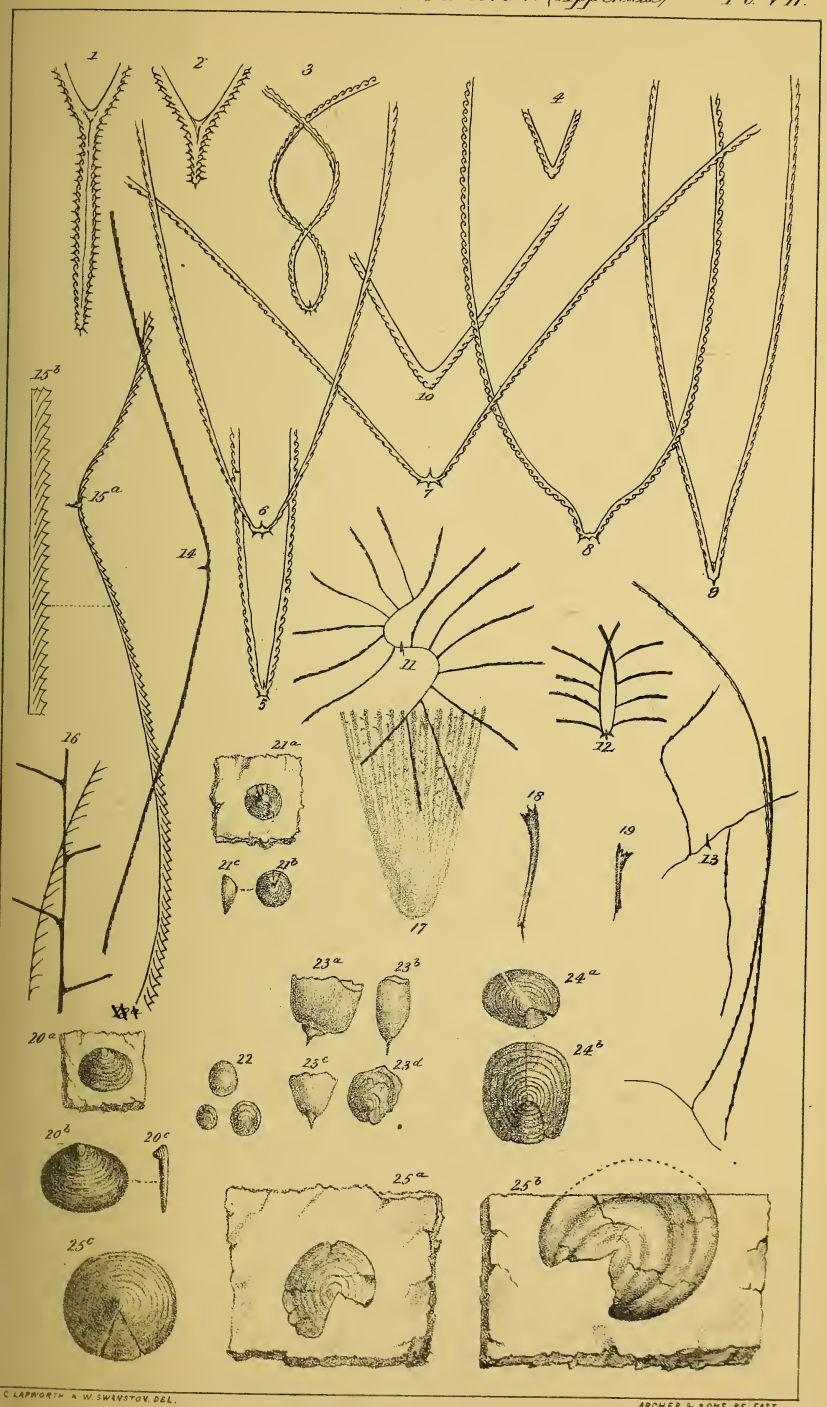
G. N. L.

Fig. 31. *Climacograptus scalaris*, His.
,, ,, ,, Var. *normalis*, Lapw.
,, 32. ,, ,, Var. *rectangularis*, M'Coy.
,, 33. ,, ,, Var. *tubuliferus*, Lapw.
,, 34. ,, ,, Var. *caudatus*, Lapw.
,, 35*a*. *Climacograptus per-excavatus*, Lapw. 35*b*, portion enlarged.
,, 36*a*. ,, *Scharenbergi*, Lapw. 36*b*, portion enlarged.
,, 37 ,, *innotatus*, Nich.
,, 38*a*. ,, *bicornis*, Hall (typical form).
,, 38*b*. ,, ,, Var. *peltifer*.
,, 38*c*. ,, ,, Var. *tridentatus*.
,, 39. ,, *cœlatus*, Lapw.
,, 40. ,, *Wilsoni*, Lapw.
,, 41. *Dicranograptus formosus*, Hopk.
,, 42*a*. ,, *ziczac*, Lapw. (typical form).
,, 42*b*. ,, ,, Var. *minimus*, Lapw.
,, 43. ,, *Clingani*, Carr.

G. N L.

EXPLANATION OF PLATE VII.

Fig. 1. *Dicranograptus ramosus*, Hall (stem only, older variety).
,, 2. ,, *Nicholsoni*, Hopk.
,, 3. *Dicellograptus caduceus*, Lapw.
,, 4. ,, *sextans*, Hall.
,, 5. ,, *anceps*, Nich.
,, 6. ,, *Morissi*, Hopk.
,, 7. ,, *Forchammeri*, Geinitz.
,, 8. ,, *elegans*, Carr.
,, 9. ,, *Moffatensis*, Carr.
,, 10. ,, ,, var. *divaricatus*, Hall.
,, 11. *Cœnograptus gracilis*, Hall.
,, 12. ,, *surcularis*, Hall.
,, 13. *pertenuis*, Lapw.
,, 14. *Leptograptus flaccidus*, Hall.
,, 15*a*. *Didymograptus superstes*, Hall. 15*b*, portion of distal extremity.
,, 16. *Thamnograptus typus* (?), Hall.
,, 17. *Dictyonema Moffatensis*, Lapw.
,, 18. *Corynoides calycularis*, Nich.
,, 19. ,, *curtus*, Lapw.
,, 20*a*. *Acrothele sp.*, *A. granulata*, Linars. 20*b c*, from original figure (Afdreg. ur. Geol., Stockholm, 1877).
,, 21*a*. *Acrotreta Nicholsoni*, Dav., Coalpit Bay. 21*c b*, from original figure of species (Geo. Mag., 1868, Pl. XVI).
,, 22. *Discina Portlockii*, Geinitz. Various examples.
,, 23. *Dawsonia campanulata*, Nich. Various examples.
,, 24*a*. *Peltocaris aptychoides*, Salter (Tieveshilly), slightly contorted specimen. 24*b*, from ~~Salter~~'s original figure (Q.J.G.S., Vol. ~~VII., p. 391~~).
,, 25*a*. *Discinocaris Browniana*, H. Wood (Coalpit Bay). 25*b*, Dobbs Linn, Dumfries. 25*c*, from original figure of species (Q.J.G.S., Vol. XXII., Pl. XXV.).



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SWANSTON & LAPWORTH - GRAPTOLITES OF CO DOWN.

APPENDIX V.

ERRATA.

Page 160—"For "Nonionina asterizans, *F. & M.*," read "Nonionina stelligera, *D'Orb.*"

Page 162—For "Lagena marginata, var. trigono-marginata, *W. & J.*," read "Lagena marginata, var. trigon~~a~~- O marginata, *P. & J.*"

APPENDIX V.

A LIST

OF THE

Post-Tertiary Foraminifera

OF THE

NORTH-EAST OF IRELAND,

BY

JOSEPH WRIGHT, F.G.S.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.;

AND

A LIST

OF THE

Mollusca of the Boulder Clay

OF THE

NORTH-EAST OF IRELAND,

BY

SAMUEL ALEX. STEWART,

Fellow of the Botanical Society of Edinburgh.

PUBLISHED BY "THE BELFAST NATURALISTS' FIELD CLUB,"
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THE POST TERTIARY FORAMINIFERA OF THE NORTH EAST OF IRELAND.

By JOSEPH WRIGHT, F.G.S.

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

The first record of Post Tertiary Foraminifera having been found in Ireland, was in a paper brought before our Club in 1874.* In it, the names of eleven species were given, as having been found in the Estuarine Clay at Magheramorne, County Antrim. That so few forms were then recorded was due to the circumstance, that the small quantity of Clay examined had been washed through sieves with the view of preserving the shells only, and in consequence, the great bulk of the Foraminifera were washed away with the fine material. Since then many of our Post Tertiary clays and gravels, have been carefully examined, and Foraminifera have been found to occur in abundance, not only in our Post Glacial beds, but also in the Boulder Clay; a deposit which until recently, and even yet by some, is presumed to contain no fossil remains. The majority of the Boulder Clays examined by me, yielded Microzoa, and it is possible that in some of the few localities where none were found, a more extended search would have led to different conclusions. At many places where the clay appeared unpromising, only small quantities were brought away for examination; and when they gave but little results, these spots were usually not revisited. That the Boulder Clay in many places was deposited in deep and quiet waters, reasonably favourable to the development of certain forms of marine life, may be inferred from the number of Foraminifera found at some stations; their tiny, delicate tests being as finely preserved as if recently dredged off our coast; and also

* Stewart—Fossils of the Estuarine Clays of Down and Antrim. Proc. Belfast Nat. Field Club, Vol. I., Appendix, p. 27, et seq.

from the fact, that *Leda pernula*, *minuta*, and *pygmea* —delicate little shells frequently occur, with both valves attached, leaving no doubt, but that they lived at those places where they are now found.

The Estuarine Clay is much newer than the Boulder Clay, and a long time must have elapsed between the termination of the one, and the commencement of the other. It was probably during this period that our Eskers were formed. This clay forms an extensive deposit along the valley of Belfast Lough, and in consequence of its vicinity to Belfast has been better examined than the equivalent clays at Strangford Lough and Lough Foyle. It occurs at Larne, underlying the gravel beds of the Curran,† and higher up Larne Lough, at Magheramorne, and occupies the greater part of the lowland on which Belfast is built. The brackish water forms, *Miliolina fusca*, *Trochammina inflata*, and *T. macrescens*, found both at King Street and beside the Cooke Statue, would lead us to infer, that when the clay was being deposited, Belfast Lough, except that it stood at a somewhat lower level, must have differed but little from its present condition. When making the new docks some years since, the shells in the Estuarine Clay were carefully tabulated by Mr. Stewart.‡ It is to be regretted that the clay was not at that time also examined for Foraminifera, as unusually fine sections were then exposed. A somewhat similar opportunity was lost for gaining a knowledge of our Boulder Clay species when, in 1842-3, the Clear Water Basin was being made, the Boulder Clay exposed during those excavations being exceptionally rich in shells, and if examined for Microzoa must have given most interesting results.

The Estuarine Clay is usually rich in Foraminifera. 42 species have been found in the clay at Blackstaff Bridge, Strangford Lough ; 72 at Magheramorne, Larne Lough ; and 98 at Limavady Station, Lough Foyle ; these, as a rule, differ but little from our recent British species. At Limavady Station, *Ramulina lævis*, and *Lingulina tenera* occur, species which are not now found off our coast. *Lagena striato-punctata* occurs in abundance at the two latter places, and as this form is now one of our rarest British Rhizopods, we may infer that a long time must have elapsed since the clay was deposited.

Under the name of Raised Beaches, may be classed the shell deposit at Portrush, and the extensive gravel beds at the Curran, Larne ; both are several feet above high water mark, and are more recent than the Estuarine Clays ; at the latter place, as also at Kilroot, these Clays may be seen underlying the gravels. A large number of Foraminifera have been found at both stations.

† Gray, rudely-worked flints of the North of Ireland, chiefly in Antrim and Down. Jour Roy. His. and Archæol. Assoc. of Ireland. Fourth series, Vol. V., No. 39, p. 130.

‡ Fossils of the Estuarine Clays of Down and Antrim.

To my friend Mr. H. B. Brady, F.R.S., I am much indebted for the kind assistance rendered me in identifying the critical species; and to my friends Mr. W. Gray, M.R.I.A.; Mr. S. A. Stewart, F.B.S.E.; and Mr. W. Swanston, F.G.S., for the valuable help they gave me in supplying material for examination, from various localities not visited by myself.

The following notes on some of the forms found may be of interest:—The *Lagenæ* were among the most interesting, and occurred in great abundance, both in numbers and species, in the Estuarine Clay at Limavady Junction. All our recent British species of *Lagena*, except *crenata*, were found at this place. Trigonal varieties of our flat Entosolenian *Lagenas* were very numerous. All the British forms had here their three-sided representatives—viz., *marginata*, *lucida*, *ornata*, *lagenoides*, and *pulchella* (small), as well as two examples of a four-sided *marginata*. These, though curious and interesting, are after all but subvarietal modifications of the types, not even ranking as good varieties. I have recorded in the list *trigono-marginata*, *(trigono) oblonga*, and *trigono-ornata*, as being the best and most characteristic of these varieties.

LAGENA STRIATO-PUNCTATA, *P. and J.*

This species, now so rare in British water, is abundant in the Estuarine Clay at Magheramorne and Limavady Junction; also, a variety very small in size, and having only six longitudinal ribs.

LAGENA ASPERA, *Reuss.*

Lagena hispida, *Reuss.* Wright, Rec. Forams. of Down and Antrim—Belfast Nat. Field Club Rep., Appendix 1876-7, Pl. IV, fig. 7.

A small *Lagena*, covered with blunt spines, having a tendency at times to run in longitudinal lines.

LAGENA HISPIDA, *Reuss.*

Lagena Jeffreysii, Brady MS. Wright, Rec. Forams. of Down and Antrim—Belfast Nat. Field Club Rep., Appendix 1876-7, Pl. IV, fig. 15.

A few examples of this rare *Lagena* have been met with in the Estuarine Clay at Limavady Junction.

BULIMINA SUBTERES, *Brady.*

Brady, Notes on Reticularian Rhizopoda of the Challenger Expedition—Quart. Jour. Micr. Sci., Vol. XX, New Series.

Not unfrequent in the Estuarine Clay at Limavady Junction. This species has only within the last twelve months been recorded as recent on our coasts.

It has been dredged off the Shetlands, by Mr. Brady, off the Isle of Skye, by Mr. Robertson, and off Killybegs Harbour, County Donegal, by myself.

CASSIDULINA BRADYI, *Norman MS.*

A few examples of this crozier-shaped *Cassidulina* have been found in the Estuarine Clay at Limavady Junction.

DISCORBINA PARISIENSIS, *D'Orb.*

Wright, Rec. Forams. of Down and Antrim—Belfast Nat. Field Club Rep., Appendix 1876-7, Pl. IV, fig. 1, a b c (not fig. 2, a b c).

Not unfrequent in the Estuarine Clays at Magheramorne and Limavady Junction.

POLYSTOMELLA ARCTICA, *P. and J.*

This boreal species has been found at several localities in the Boulder Clay.

POST GLACIAL LOCALITIES.

1. Curran, Larne—Very extensive gravel beds; shells not unfrequent; Foraminifera plentiful.

2. Portrush—A considerable accumulation of broken shells in the hollows of the rocks above high-water mark on the shore convenient to the town of Portrush; Foraminifera plentiful.

Cooke's Statue, Wellington Place, Belfast—Estuarine Clay exposed at the opening of a sewer near the statue. The Foraminifera indicate brackish water conditions. All the species found, were also met with at the next station (Well, King Street), where also the following four species occurred—viz., *Miliolina oblonga*, *fusca*, *Polymorphina lactea*, and *Verneuilina polystropha*, these not having been found at this locality.

3. Well, King Street, Belfast—In the sinking for a well at Messrs. Swanston & Bones's, King Street, a few hundred yards from the last locality, the following beds were passed through :—

Estuarine Clay, 6 feet.	Estuarine Clay of the usual yellowish grey colour; Foraminifera rather common; more numerous than at Cooke's statue—*Miliolina oblonga*, *fusca*, *Trochammina squamata*, *inflata*, *macrescens*, *Lagena lucida*, *Polymorphina lactea*, *Verneuilina polystropha*, *Rotalia Beccarii*, *Polystomella crispa*, *striato-punctata*, *Nonionina depressula*.

Estuarine Clay, 22 feet.	Estuarine Clay of brownish colour and with offensive smell; Foraminifera very common—*Miliolina oblonga*, *Trochammina inflata* (very fine), *macrescens*, *Lagena lucida*, *Polymorphina lactea*, *Rotalia Beccarii*, *Polystomella striato-punctata*, *Nonionina depressula*.
Fine Sand, 24 feet.	Fine Sand; Foraminifera rare, possibly washed in from the overlying Estuarine Clay during the sinking of Well—*Trochammina inflata*, *Rotalia Beccarii*, *Polystomella striato-punctata*, *Nonionina depressula*.
Boulder Clay, 50 feet.	Clay very fine; Foraminifera very rare—*Rotalia Beccarii*, *Polystomella striato-punctata*.
Boulder Clay, 100 feet.	Boulder Clay as it usually occurs in our neighbourhood; Foraminifera plentiful—*Miliolina seminulum*, *Lagena Williamsoni*, *costata*, *lucida*, *melo*, *Globigerina bulloides*, *Cassidulina crassa*, *Rotalia Beccarii*, *Polystomella striato-punctata*, *Nonionina depressula*.

4. Estuarine Clay exposed in the deepening of Mr. MacLaine's dock Corporation Street, Belfast, 1879.

5. Magheramorne—Estuarine Clay on the West shore of Larne Lough—An extensive bank of this clay occurs along the shore, a few hundred yards south of the ferry-slip, close to the railway station. *Lagena striato-punctata*, now one of our rarest British *Lagenas*, occurs here in abundance. as also at Limavady Junction. Shells and Foraminifera are abundant.

6. Blackstaff Bridge, Strangford Lough, on Blackstaff River, about two miles South of Kirkcubbin and East of the road to Portaferry.

7. Limavady Junction, Lough Foyle—Estuarine Clay slightly above high water, close to the railway station. To Mr. Gray is due the credit of being the first to discover Estuarine Clay at this place, as also at Blackstaff Bridge. The clay is exceptionally rich in Foraminifera. A few Polycistinæ were found here.

BOULDER CLAY LOCALITIES.

1. Water Works, Belfast.—In excavating for the Clear Water Basin, in 1841-3, Boulder Clay was exposed, containing an abundance of shells, many of them water-worn.* The only material examined for Foraminifera was a little of the clay washed out of a few specimens of *Buccinum undatum*. Six species were found in this way, and considering the very small quantity of the clay examined, it may be considered fairly rich in Foraminifera.

2. Falls Park, Belfast, about 3 miles from the town, on the Falls Road.—Boulder Clay cut through by a small stream that flows through the Park. Mr. Stewart was the first to discover fossils at this place. The discovery was of special interest, as the clay contained several shells not usually met with in Boulder Clay, and in this respect appears very similar to the clay excavated some years ago in making the new basin at the Water Works locality, but which is not now accessible.

3. Castle-Espie, Co. Down.—Three miles from Comber, on the shore of Strangford Lough.—Thick beds of Boulder Clay resting on Carboniferous Limestone at the quarries and pottery works. The surface of the limestone is beautifully polished and grooved with ice action.

4. Cherry Valley, near Comber.—Cliffs of Boulder Clay, on the shore of Strangford Lough, 1 mile S.E. of Comber. No shells found, Foraminifera rare.

5. Ballyholme Bay, Co. Down, half a mile N.E. of Bangor.—Bank of Boulder Clay on the shore now covered by a sea-wall. Very little of the clay examined.

6. Knock Glen, Co. Down, near the Knock Railway Station.—Cliffs of Boulder Clay in the Glen, cut through by the stream Conswater. Shells rather rare, Foraminifera plentiful.

7. Woodburn Glen, 1 mile N.W. of Carrickfergus, Co. Antrim.—High banks of Boulder Clay at the side of the river Woodburn between the bridges. *Leda pernula* and *minuta*, with both valves attached, are not unfrequent. The clay here contains Foraminifera in great profusion; 50 species were de-

* See Portlock's Geol. Rep., Londonderry, &c., pp. 738-740.

tected; and as a large quantity of the clay has been examined the list from this locality gives a good record of the Foraminifera of the period. *Nonionina arctica* is not uncommon, now very rare as a British species, and only met with off our extreme Northern coast.

8. Black Head.—Boulder Clay on the shore, half a mile N. of the Head.

9. Gobbins, Islandmagee.—Boulder Clay on the shore, 1 mile South of the Headlands.

10 & 11. Ballyrudder, 2 miles N.W. of Ballygally Head.—Bank of Boulder Clay, also Glacial Gravels underlying the clay; both contain Foraminifera.

12. Bovevagh Church, Co. Derry, near the village of Dungiven.—Fine Clay containing *Turritella terebra* in profusion;* Foraminifera abundant, especially *Lagenas*.

Killyleagh, near Shrigley, Co. Down.—No shells found. Foraminifera as follows:—*Truncatulina lobatula*, *Globigerina bulloides*, *Nonionina depressula*, and *Discorbina globularis*. Only a small quantity of the clay examined.

Crumlin River, Co. Antrim, about midway between Crumlin and Lough Neagh.—A small patch of fine Clay a few yards in extent is here cut through by the Crumlin River. It contains very fragile examples of *Mytilus edulis* in profusion. The following Foraminifera have been found:—*Nonionina depressula*, *Globigerina bulloides*, *Discorbina globularis*, and *Textularia variabilis*. Mr. E. T. Hardman, F.G.S., has—in a paper published by him in the "Geological Magazine," of Dec., 1876—stated that these beds are lacustrine and of Pliocene age. Since that paper was published, Mr. W. Swanston, F.G.S.,† has made a careful examination of these clays, and the result has shown Mr. Hardman's conclusions were incorrect, the beds in question being Marine Boulder Clay.

Glacial Gravel beds occur at many places in the vicinity of Dublin. Three of these—viz.: Balscadden Bay, Ballybrack Station, and Ballyedmonduff—were visited by me in the Summer of 1879, and some of the gravels from each of these places brought away for examination. As no Microzoa have as yet been

* Portlock's Geol. Rep., Londonderry, &c., pp. 157-159.

† Supposed Fossiliferous Clays on the shore of Lough Neagh.—Geol. Mag., Feb., 1879.

recorded from these gravels, the following list of the Foraminifera found at the above localities may be of interest :—

LIST OF SPECIES.	Balscadden Bay.	Ballybrack Station.	Ballyedmonduff.
MILIOLINA trigonula, *Lamk.* ...	...	c	...
oblonga, *Montagu* ...	...	r	...
Brongniartii, *D'Orb.* ?	...	...	r
seminulum, *Linn.* ? ...	r	...	...
subrotunda, *Montagu*	..	r	...
TEXTULARIA variabilis, *Will.*	r	r	..
BULIMINA pupoides, *D'Orb.* ...	...	r	..
CASSIDULINA crassa, *D'Orb.* ...	r	r	...
LAGENA sulcata, *W. & J.* ...	...	r	...
Williamsoni, *Alcock* ...	c	c	...
striata, *D'Orb.* ...	r	r	...
marginata, *W. & J.* ...	...	r	...
lucida, *Will.* ...	r	...	...
melo, *D'Orb.* ...	...	r	...
squamosa, *Montagu* ...	r	...	...
hexagona, *Will.* ...	r	r	...
POLYMORPHINA lactea, *W. & J.*	c	...	...
compressa, *D'Orb.* ...	...	r	...
GLOBIGERINA bulloides, *D'Orb.*	r	...	..
TRUNCATULINA lobatula, *Walker*	r	r	...
ROTALIA Beccarii, *Linn.* ...	r	c	...
POLYSTOMELLA crispa, *Linn.*	...	r	r
striato punctata, *F. & M.* ...	c	v c	r
NONIONINA depressula, *W. & J.* ...	v c	v c	c

TABLE SHOWING THE DISTRIBUTION OF THE FORAMINIFERA IN THE POST GLACIAL DEPOSITS OF THE NORTH EAST OF IRELAND.

ABBREVIATIONS:—v. r., very rare; r., rare; c., common; v. c., very common.

	Raised Beaches.		Estuarine Clays.					
LIST OF SPECIES.	Curran, Larne.	Portrush.	Well—King Street, Belfast	Docks, Belfast.	Magheramorne, Larne Lough.	Larne.	Blackstaff Bridge, Strangford Lough.	Limavady Station, Lough Foyle.
	1	2	3	4	5	6	7	8
CORNUSPIRA, *Schultze.*								
involvens, *Reuss*	...	r	...	r	c	r	vr	c
BILOCULINA, *D'Orb.*								
ringens, *Lamk.*	...	r	...	...	vr	vr	...	vr
depressa, *D'Orb.*	...	c	...	...	...	r	...	r
elongata, *D'Orb.*	...	r	...	...	...	...	..	r
MILIOLINA, *Will.*								
trigonula, *Lamk.*	r	vr	...	r	c	...	r	r
tricarinata, *D'Orb.*	r	...	...	...	c	r	...	c
oblonga, *Montagu*	...	r	r	...	c	r	r	r
Brongniartii, *D'Orb.*	r	...	...	...	r	...	r	r
seminulum, *Linn.*	r	c	...	r	vc	r	vc	vc
subrotunda, *Montagu*	r	vc	...	vr	c	r	c	vc
secans, *D'Orb.*	...	...	...	...	...	...	r	...
bicornis, *W. and J.*	r	c	...	...	vc	r	c	r
fusca, *Brady*	...	...	vr	..	...	...	...	...
SPIROLOCULINA, *D'Orb.*								
limbata, *D'Orb.*	r	...	...	r	c	...	r	...
planulata, *Lamk.*	...	...	...	...	c	vr	...	vr
canaliculata, *D'Orb.*	r	vr	...	r	r	...	...	...
TROCHAMMINA, *P. and J.*								
squamata, *P. and J.*	...	...	r	...	vr	vr	r	vr
inflata, *Montagu*	...	...	c	...	vr	r	r	vr
macrescens, *Brady*	...	...	r	...	...	r	...	vr
HAPLOPHRAGMIUM, *Reuss.*								
canariensis, *D'Orb.*	...	vr	...	...	vr	r	vr	vr
TEXTULARIA, *Defrance.*								
sagittula, *Defrance*	r	r	...	r	...	r	...	r
variabilis, *Will.*	c	vc	...	c	c	c	c	vc
difformis, *Will.*	r	c	...	...	...	r	...	r
pygmea, *D'Orb.*	...	...	...	..	...	r	...	...
VERNEUILINA, *D'Orb.*								
polystropha, *Reuss*	r	...	vr	r	r	...	..	vr

TABLE—(Continued.)

LIST OF SPECIES.	Raised Beaches.		Estuarine Clays.					
	Curran, Larne.	Portrush.	Well—King Street, Belfast	Docks, Belfast.	Magheramorne, Larne Lough.	Larne.	Blackstaff Bridge, Strangford Lough.	Limavady Station, Lough Foyle.
	1	2	3	4	5	6	7	8
BULIMINA, *D'Orb.*								
pupoides, *D'Orb.*	v r	v r	...	c	r	r	...	c
marginata, *D'Orb.*	r	v r	...	c	r	r	v r	r
ovata, *D'Orb.*	v c	c	...	v c	r	c	v r	v c
elegantissima, *D'Orb.*	..	...	...	v c	v r	c	r	c
subteres, *Brady MS.*	...	...	...	...	...	r	...	r
VIRGULINA, *D'Orb.*								
Schreibersii, *Czjzek*	v r	...	...	c	r	...	v r	r
BOLIVINA, *D'Orb.*								
punctata, *D'Orb.*	v r	...	...	...	r	r	v r	r
plicata, *D'Orb.*	r	r	...	r	c	v c	c	r
CASSIDULINA, *D'Orb.*								
lævigata, *D'Orb.*	r	v r	...	...	...	v r	...	r
crassa, *D'Orb.*	c	v c	...	...	v r	r	v r	v c
Bradyi, *Norman MS.*	...	...	..	...	...	...	...	v r
LAGENA, *W. and J.*								
sulcata, *W. and J.*	c	c	...	...	v r	c	v r	r
costata, *Will.*	v r	r	...	..	r	r	...	r
Williamsoni, *Alcock*	v c	v c	...	...	v c	v c	v r	v c
Lyellii, *Seguenza*	...	...	...	...	v r	...	...	r
lævis, *Montagu*	v c	v c	...	c	v c	c	r	v c
gracillima, *Segnenza*	r	...	...	r	v r	...	v r	r
globosa, *Montagu*	r	r	...	...	r	r	v r	r
striata, *D'Orb.*	r	r	...	c	c	r	v r	c
gracilis, *Will.*	...	...	...	...	...	...	...	r
striato-punctata, *P. and J.* ...	...	...	...	...	v c	...	...	c
semistriata, *Will.*	r	r	...	r	r	r	c	r
aspera, *Reuss*	...	v r	..	...	...	...	...	r
hispida, *Reuss*	...	...	...	...	...	...	...	v r
caudata, *D'Orb.*	c	c	...	...	c	r	r	c
marginata, *W. and J.*	c	c	...	...	r	c	r	v c
var. trigono-marginata, *P. and J.*	v r	...	...	...	v r	v r	...	r
lucida, *Will.*	c	r	r	v c	v c	c	c	v c
var. (trigono) oblonga, *Seguenza*	v r	...	...	...	r	r	...	r
pulchella, *Brady*	...	...	...	...	...	...	...	v r
ornata, *Will.*	c	v r	...	...	...	r	...	v c
var. trigono-ornata, *Siddall* ...	...	...	...	..	...	...	...	v r

TABLE—(Continued).

LIST OF SPECIES.	Raised Beaches.		Estuarine Clays.					
	Curran, Larne.	Portrush.	Well—King Street, Belfast	Docks, Belfast.	Magheramorne, Larne Lough.	Larne.	Blackstaff Bridge, Strangford Lough.	Limavady Station, Lough Foyle.
	1	2	3	4	5	6	7	8
LAGENA, *W. & J.*								
lagenoides, *Will.*	...	...	...	...	..	v r	...	c
melo, *D'Orb.*	v c	c	...	...	r	v c	c	v c
squamosa, *Montagu*	v r	v c	...	...	c	v r	...	r
hexagona, *Will.*	r	c	...	...	c	c	...	c
RAMULINA, *Jones.*								
lævis, *Jones*	...	...	...	...	v r	...	...	v r
LINGULINA, *D'Orb.*								
carinata, *D'Orb.*	...	...	.	...	...	...	...	r
tenera, *Bornemann*	...	...	...	...	...	...	...	v r
NODOSARIA, *Lamk.*								
raphanus, *Linn.*	...	..	...	...	...	...	...	v r
scalaris, *Batsch.*	r	v r	...	...	v r	r	...	r
pyrula, *D'Orb.*	r	v r	...	...	r	r	...	r
radicula, *Linn.*	...	...	..	...	...	v r	...	r
DENTALINA, *D'Orb.*								
communis, *D'Orb.*	v r	...	...	...	...	...	...	r
guttifera, *D'Orb.*	...	...	...	...	...	...	...	r
obliqua, *D'Orb.*	...	...	...	...	v r	v r	...	r
VAGINULINA, *D'Orb.*								
legumen, *Linn.*	...	...	...	...	...	r	...	v r
MARGINULINA, *D'Orb.*								
lituus, *D'Orb.*	...	...	...	...	...	...	...	r
CRISTELLARIA, *Lamk.*								
rotulata, *Lamk.*	v r	...	...	...	v r	v r	...	v r
crepidula, *F. & M.*	v r	v r	...	...	...	...	...	v r
POLYMORPHINA, *D'Orb.*								
lactea, *W. & J.*	r	r	r	v r	v r	r	c	r
gibba, *D'Orb.*	c	v c	...	...	r	c	c	r
oblonga, *Will.*	r	v r	..	...	v r	v r	...	r
compressa, *D'Orb.*	v r	r	...	...	r	r	r	r
concava, *Will.*	...	...	...	...	...	...	...	r
myristiformis, *Will.*	...	r	...	...	...	...	...	v r
UVIGERINA, *D'Orb.*								
angulosa, *Will.*	v r	c	...	...	v r	r	v r	r
ORBULINA, *D'Orb.*								
universa, *D'Orb.*	...	r	...	...	...	...	...	r

TABLE—(Continued).

LIST OF SPECIES.	Raised Beaches.		Estuarine Clays.					
	Curran, Larne.	Portrush.	Well, King Street, Belfast.	Docks, Belfast.	Magheramorne, Larne Lough.	Larne.	Blackstaff Bridge, Strangford Lough.	Limavady Station, Lough Foyle.
	1	2	3	4	5	6	7	8
GLOBIGERINA, *D'Orb.*								
bulloides, *D'Orb.*	vc	vc	...	...	r	vc	vr	vc
inflata, *D'Orb.*	...	c	...	...	...	...	...	r
SPIRILLINA, *Ehrenb.*								
vivipera, *Ehrenb.*	vr	...	...	...	c	...	...	r
PATELLINA, *Will.*								
corrugata, *Will.*	vr	vr	...	..	c	r	r	r
DISCORBINA, *P. & J.*								
rosacea, *D'Orb.*	...	...	...	...	r	...	...	r
globularis, *D'Orb.*	c	r	...	vr	r	c	vr	c
Parisiensis, *D'Orb.*	...	...	...	...	r	...	...	r
Bertheloti, *D'Orb.*	...	...	...	...	...	...	...	vr
PLANORBULINA, *D'Orb.*								
Mediterranensis, *D'Orb.*	r	r	...	...	r	c	r	r
TRUNCATULINA, *D'Orb.*								
lobatula, *Walker*	vc	vc	...	r	r	c	c	r
refulgens, *Montfort*	...	...	...	..	vr	...	vr	...
TINOPORUS, *Montfort.*								
lævis, *P. & J.*	..	vr	..	...	...	...	...	vr
lucidus, *Brady MS.*	..	...	...	...	vr	vr	r	vr
PULVINULINA, *P. & J.*								
auricula, *F. & M.*	...	r	...	...	...	vr	...	c
ROTALIA, *Lamk.*								
Beccarii, *Linn.*	r	r	vc	vc	c	vc	vc	vc
nitida, *Will.*	r	r	..	...	r	r	r	c
NONIONINA, *D'Orb.*								
umbilicatula, *Montagu*	vr	...	...	...	vr	...	..	...
depressula, *W. & J.*	c	c	vc	vc	c	vc	vc	vc
turgida, *Will.*	c	r	...	...	r	r	vr	c
scapha, *F. & M.*	...	r	...	...	vr	vr	vr	vr
~~asterizans, *F. & M.*~~	...	...	...	...	r	...	...	r
POLYSTOMELLA, *Lamk.*								
crispa, *Linn.*	vc	c	c	r	vc	vc	vc	c
striato-punctata, *F. & M.* ...	c	r	vc	r	r	vc	c	vc

TABLE SHOWING THE DISTRIBUTION OF THE FORAMINIFERA IN THE BOULDER CLAY DEPOSITS OF THE NORTH EAST OF IRELAND.

LIST OF SPECIES.	Waterworks, Belfast.	Falls Park, Belfast.	Castle-Espie, Co. Down.	Cherry Valley, Co. Down.	Ballyholme Bay, Co. Down.	Knock Glen, Co. Down.	Woodburn Glen, Carrickfergus.	Black Head, Co. Antrim.	Gobbins, Islandmagee.	Ballyrudder, Co. Antrim.	Ballyrudder, Co. Antrim (gravel).	Bovevagh Church, Co. Derry.
	1	2	3	4	5	6	7	8	9	10	11	12
CORNUSPIRA, *Scultze.*												
involvens, *Reuss*	...	...	...	...	...	...	r	...	...	...	..	...
BILOCULINA, *D'Orb.*												
ringens, *Lamk.*	...	r	r	...	...	r	vc	c	...	...	vr	r
depressa, *D'Orb.*	r	...	...	...	..	...	vr	...	...	...	...	...
elongata, *D'Orb.*	...	...	...	...	...	...	r	c	...	...	...	..
MILIOLINA, *Will.*												
tricarinata, *D'Orb.*... ...	...	..	...	...	...	...	c	...	...	...	...	...
oblonga, *Montagu*	r	...	...	...	...	...	c	...	...	..	vr	...
Brongniartii, *D'Orb.* ...	...	..	...	...	...	...	r	...	..	...	...	...
seminulum, *Linn.*	r	..	...	...	...	...	r	...	...	...	...	...
subrotunda, *Montagu* ..	...	c	...	...	..	r	vc	vc	...	...	vr	c
SPIROLOCULINA, *D'Orb.*												
limbata, *D'Orb.*	...	vr	...	...	..	...	...	...	...	...	...	...
HAPLOPHRAGMIUM, *Reuss.*												
canariensis, *D'Orb.* ...	..	...	...	...	...	...	vr	...	...	...	...	...
TEXTULARIA, *Defrance.*												
sagittula, *Defrance* ...	...	...	...	...	...	...	vr	...	...	...	r	...
variabilis, *Will.*	...	...	r	...	...	r	r	vr	...	r	r	c
difformis, *Will.*	...	...	...	...	...	vr	...	...	...	...	...	r
BULIMINA, *D'Orb.*												
pupoides, *D'Orb.*	...	r	...	...	...	...	r	...	...	...	r	c
marginata, *D'Orb.*... ...	...	...	...	..	...	vr	r	...	...	...	...	r
ovata, *D'Orb.*	...	...	...	...	...	r	vr	...	...	...	vr	r
elegantissima, *D'Orb.* ...	...	...	...	...	...	vr	...	...	...	...	vr	...
VIRGULINA, *D'Orb.*												
Schreibersii, *Czjzek* ...	...	...	...	...	...	...	vr	...	...	...	...	...
BOLIVINA, *D'Orb.*												
punctata, *D'Orb.*	...	...	..	...	...	...	...	...	...	...	..	vr
plicata, *D'Orb.*	...	r	...	...	...	...	vr	...	...	...	...	vr

TABLE—(Continued).

LIST OF SPECIES.	Waterworks, Belfast.	Falls Park, Belfast.	Castle-Espie, Co. Down.	Cherry Valley, Co. Down.	Ballyholme Bay, Co. Down.	Knock Glen, Co. Down.	Woodburn Glen, Carrickfergus.	Black Head, Co. Antrim.	Gobbins, Islandmagee.	Ballyrudder, Co. Antrim.	Ballyrudder, Co. Antrim (gravel).	Bovevagh, Church, Co. Derry.
	1	2	3	4	5	6	7	8	9	10	11	12
CASSIDULINA, *D'Orb.*												
lævigata, *D'Orb.*	...	vr	...	...	...	...	vr	...	..	...	...	...
crassa, *D'Orb.*	...	vc	r	...	...	vc	vr	vr	...	...	r	r
LAGENA, *W. and J.*												
sulcata, *W. and J.* ...	...	r	...	...	...	r	r	...	...	...	r	vr
costata, *Will.*	...	...	...	...	...	vr	r	vr	...	...	...	...
Williamsoni, *Alcock* ...	...	c	r	...	r	r	vc	r	r	r	c	c
lævis, *Montagu*	...	...	r	...	...	vr	vr	...	vr	...	r	c
gracillima, *Seguenza* ...	...	vr	...	...	...	r	r	...	...	...	...	...
globosa, *Montagu*	...	...	...	...	...	vr	vr	r	...	...	...	r
striata, *D'Orb.*	...	r	...	...	...	vr	r	...	...	...	vr	c
gracilis, *Will.*	...	...	...	...	...	...	vr	...	...	...	...	...
semistriata, *Will.*	...	r	...	...	...	...	vr	...	...	r	...	vr
caudata, *D'Orb.*	...	r	...	...	...	r	r	...	vr	...	r	r
marginata, *W. and J.* ...	...	c	c	...	...	c	c	...	...	c	c	r
var. trigono-marginata, *W.*	...	...	...	...	vr	...	...	...	...	...	...	...
lucida, *Will.* [*and J.*]	...	r	r	...	...	vr	c	c	...	...	c	c
melo, *D'Orb.*	...	r	r	...	...	r	r	r	vr	vr	c	r
squamosa, *Montagu* ...	...	...	...	...	...	r	vr	...	...	...	...	...
hexagona, *Will.*	...	c	...	...	...	...	...	..	...	...	...	c
NODOSARIA, *Lamk.*												
scalaris, *Batch.*	...	vr	...	...	...	...	...	...	...	...	...	...
VAGINULINA, *D'Orb.*												
legumen, *Linn.*	...	...	...	...	...	...	vr	...	...	...	..	...
CRISTELLARIA, *Lamk.*												
crepidula, *F. and M.* ...	...	...	...	...	...	...	...	..	...	...	...	vr
POLYMORPHINA, *D'Orb.*												
lactea, *W. and J.*	...	c	...	...	...	r	vc	c	r	...	vr	r
fusiformis, *Rœmer* ..	...	...	...	...	...	...	r	...	...	...	..	...
gibba, *D'Orb.*	...	...	...	...	...	...	vr	...	...	...	...	...
compressa, *D'Orb.* ...	...	c	c	...	...	vr	r	...	...	r	...	...
UVIGERINA, *D'Orb.*												
angulosa, *Will.*	...	r	.	...	...	..	r	...	...	...	r	r
ORBULINA, *D'Orb.*												
universa, *D'Orb.*	...	...	...	...	...	...	...	...	...	...	r	...

TABLE—(Continued).

LIST OF SPECIES.	Waterworks, Belfast.	Falls Park, Belfast.	Castle-Espie, Co. Down.	Cherry Valley, Co. Down.	Ballyholme Bay, Co. Down.	Knock Glen, Co. Down.	Woodburn Glen, Carrickfergus.	Black Head, Co. Antrim.	Gobbins, Islandmagee.	Ballyrudder, Co. Antrim.	Ballyrudder, Co. Antrim (gravel).	Bovevagh Church, Co. Derry.
	1	2	3	4	5	6	7	8	9	10	11	12
GLOBIGERINA, *D'Orb.*												
bulloides, *D'Orb.*	...	c	c	r	..	c	r	vr	...	r	c	c
PATELLINA, *Will.*												
corrugata, *Will.*	...	vr	...	...	...	vr	vr	...	...	...	...	...
DISCORBINA, *P. and J.*												
rosacea, *D'Orb.*	...	...	...	...	...	...	...	...	..	...	vr	...
globularis, *D'Orb.* ...	...	...	...	...	...	vr	r	...	...	...	...	r
PLANORBULINA, *D'Orb.*												
Mediterranensis, *D'Orb.* ...	...	...	...	...	...	...	vr	...	..	..	..	...
TRUNCATULINA, *D'Orb.*												
lobatula, *Walker*	r	c	...	r	...	c	vr	...	vr	r	r	r
ROTALIA, *Lamk.*												
Beccarii, *Linn.*	r	c	r	r	...	c	r	vr	vr	c	r	vr
nitida, *Will.*	...	...	...	r	...	...	...	...	...	...	...	...
NONIONINA, *D'Orb.*												
depressula, *W. and J.* ...	...	vc	vc	r	c	vc	vc	vc	c	vc	vc	vc
scapha, *F. and M.* ..	...	..	...	...	...	...	vr	...	...	...	...	...
POLYSTOMELLA, *Lamk.*												
crispa, *Linn.*	r	...	...	...	...	..	c	...	r	r	...	r
striato-punctata, *F. and M.*	...	vc	...	r	...	...	c	...	...	...	...	vc
arctica, *P. and J.* ...	...	c	...	...	...	...	c	r	r	...	...	...

[*Proceedings Belfast Naturalists' Field Club—Appendix*, 1879-80.]

THE MOLLUSCA OF THE BOULDER CLAY OF THE NORTH EAST OF IRELAND.

By S. A. STEWART,

Fellow of the Botanical Society of Edinburgh.

Amongst the British deposits of the Glacial Period the Boulder Clay is undoubtedly the most important. Though of small magnitude, as compared with beds of greater antiquity, yet it exhibits such remarkable characters as render it unique, and in the entire sedimentary series there are no rocks which can be classed as altogether similar. Attempts have been made to prove a succession of Glacial Epochs in not only Secondary, but also Palæozoic times; but if Glacial conditions ever prevailed during those eras, only comparatively faint and questionable evidences remain to us, and the epoch to which the Boulder Clay belongs must still be regarded as *the* Glacial Epoch.

The structure and physical characters of the Boulder Clay, as it occurs in this district, are so distinct that it may be recognised without difficulty, and it has been accurately described by successive writers from the time of Portlock down to the present. It is a stiff, compact, unstratified clay, usually reddish brown, but sometimes blue, very tenacious when moist, and containing numerous boulders, as well as many smaller stones. These boulders and stones have their angles more or less rounded off, their surfaces being in most cases scratched or striated, and such as admit of polishing—especially the limestones—are often beautifully polished. The larger portion of the stones have been derived from local rocks; but such as are not from the immediate vicinity have been transported from somewhere to the north, sometimes east of north, and often to the west of north.

The Molluscan shells occurring in the Boulder Clay are not numerous ; in most cases they are only found by patient searching, and then only in a fragmentary condition ; but in a few instances they are less rare, and include specimens in a perfect state. *Astarte sulcata*, A. *elliptica*, A. *compressa*, and *Leda pernula* are the prevailing and characteristic forms ; the most widely diffused and the most numerous in examples. Fragments of these shells are to be found almost everywhere, and perfect shells are frequently met with. *Leda pygmæa* is also remarkable. Though a very small and fragile shell, it is usually found in a perfect state, with the two valves united. The presence of perfect shells of *Leda* was known long since to General Portlock, and forced him to the same conclusion as arrived at by the Author, that the Boulder Clay is a marine sedimentary deposit. The absence of stratification has led most geologists to the conclusion that the Boulder Clay is an accumulation resulting from land ice, and the occurrence in it of so many marine shells seems to have been either unknown or overlooked. The fauna of the Boulder Clay is not by any means rich, and this is what we might expect from the rigour of the climate of that period. Nevertheless it is a marine fauna ; and there is unquestionable evidence in the case of several of the species that they truly belong to the deposit, and were not drifted into their present position from a distant locality, nor yet are they fossils derived from an older bed.

From what has been stated, it will be seen that we must account for the want of stratification in some other way than the land-ice theory, as the presence of even one marine shell unquestionably belonging to the deposit renders that theory invalid. The supposition of a general ice-cap can derive no support from the Boulder Clay. The underlying rocks are very often glaciated, and bear striæ which tell of ice that was moving over them from the north, and this is corroborated by the stones contained in the clay, which also tend to show a similar ice movement. We must, therefore, conclude that the clay was rapidly deposited from water-borne ice, and that the ice, with its burthen of clay and stones, was impelled by currents having a more or less southerly direction. On the floor of the sea lived a scanty boreal fauna. Many of the shells were broken into fragments by the ice grounding in the shallow waters, or by the dropping down of large boulders, and the result that remains is the unstratified till, with its occasional entire shells and more numerous fragments.

The Boulder Clay forms the subsoil over the greater part of our district adding much to the fertility of the land. It is best seen in river banks, because the streams have made sections of the strata, and thereby exposed it to our view. It has, consequently, been often considered as only, or mainly, deposited in sheltered hollows ; but it is found that where artificial cuttings have been

made, as in quarries or roads, they discover the Boulder Clay equally on the hill-side or level plain.

The Glacial Drift has been divided by geologists of eminence into three stages—First, the lower Boulder Clay, the most extensive, and displaying the greatest evidence of Arctic conditions; second, certain sands and gravels deposited under milder conditions of climate; and third, the upper Boulder Clay, which is said to indicate a recurrence of Arctic conditions. My researches do not lead me to accept this classification. I am unable to separate it into upper and lower, and the gravels said to be interglacial seem to be only local modifications of the deposits of one continuous period, during which Arctic, or semi-Arctic, conditions prevailed over this country without any interval of relaxation. The sands and gravels at Ballyrudder, near Glenarm, which Professor Hull regards as interglacial,* yield abundant specimens of a fauna as Arctic in character as any portion of the Boulder Clay, and are overlaid by an unstratified clay which I cannot distinguish from deposits which are said to be lower Boulder Clay.

FOSSIL LOCALITIES.

BELFAST WATERWORKS.

The Boulder Clay at this locality has yielded a much larger number of Molluscan remains than any other similar deposit in Ireland. Forty-seven different shells are enumerated in the subjoined list, mostly collected in 1842-3 by the late Messrs. James Bryce, F.G.S., and George C. Hyndman, who published their results in Portlock's Report on the Geology of Londonderry, pp. 738-9. A further and more complete list of the shells of the Waterworks was given by Mr. Bryce in the "Philosophical Magazine," vol. 26, pp. 433-5. This deposit of Boulder Clay was proved to be undoubtedly rich in fossils; but it is not, however, to be inferred that, as compared with other localities, this spot was so excessively rich as would appear from the lists. Mr. Bryce states that about ten thousand cubic yards of the clay were removed during the excavations for the lower reservoir, and that the great number of shells obtained was due to the watchfulness of various collectors. In other instances only the surface of a limited section can be examined, and it will be seen that no fair

* Hull—Physical Geology and Geography of Ireland, p. 88.

comparison is possible: The four species added by me to the list published by Bryce were obtained by close scrutiny of material collected by the late Mr Hyndman, the deposit being now inaccessible.

WOODBURN, COUNTY ANTRIM.

A deep bed of Boulder Clay is, for a considerable distance, cut through by the Woodburn River, at rather more than a mile north-west of Carrickfergus. This bed has yielded ten species of shells, and is notable for the occurrence of three species of *Leda*, many of the specimens being in a perfect state. *Trophon latericeus* was also found here.

FALLS PARK, BELFAST.

This locality is close to the town, opening to the Falls Road. The clay here would be quite as rich in fossils as that of the Waterworks if sufficient material were available. The beds are exposed only in the low banks of the small stream that flows through the park, and, consequently, the search for fossils can only be conducted by examining the surfaces of the sections. Seven species have been collected here, all of northern types, including *Astarte triangularis* and *Trophon Gunneri*, which are not recorded from any of the other localities. Fragments of *Balani* are frequent here, as in all the fossil localities I have examined, except Bovevagh.

BANGOR, COUNTY DOWN.

The Boulder Clay is seen in a high bank on the shore at Ballyholme, half a mile north-east of Bangor. Six species of the usual northern forms have been found in this spot. The rocks, where denuded of clay, are seen to be finely glaciated.

KNOCK, COUNTY DOWN.

A small stream (Connswater) has exposed the Boulder Clay in the high banks of Knock Glen, near the Knock railway station. Shells are not plentiful at this plaee; four species only have been found. *Leda minuta* and *Leda pygmæa* are not rare; they usually occur quite perfect.

CASTLE-ESPIE, COUNTY DOWN.

Three miles from Comber, on the shore of Strangford Lough, there is an extensive deposit of Boulder Clay resting on Carboniferous Limestone, which is beautifully polished and striated. Shells are very scarce in the clay. *Astarte sulcata* and a *Leda* were the only forms recognised.

CRUMLIN RIVER, COUNTY ANTRIM.

The Boulder Clay is exposed at several points on the Crumlin River, and this locality is remarkable for the occurrence of a small patch, not much over a square yard in extent, as far as seen, but crowded with shells of *Mytilus edulis* in a very fragile condition. This bed is exposed on the south bank of the river, at about midway between Crumlin and the shore of Lough Neagh. It was discovered by Mr. E. T. Hardman, F.G.S., who supposed the shells to represent a species of *Unio*, and the clay to be a lacustrine deposit of Pliocene age.* Mr. W. Swanston, F.G.S., has shown† that the shells are really the tests of the common mussel, and that the clay is truly glacial. No other shells have been found associated with the *Mytilus*, but Mr. Joseph Wright, F.G.S., has found several species of Foraminifera.

BOVEVAGH RIVER, COUNTY DERRY.

This bed is situated not far from the village of Dungiven, and was described by Portlock in the Report on the Geology of Londonderry, page 159. It is only remarkable on account of the occurrence, in a very limited exposure of great numbers of *Turretella terebra*, a shell that seems to be rare in the Boulder Clay elsewhere in Ireland.

BALLYRUDDER, COUNTY ANTRIM.

A most interesting glacial bed is to be seen at Ballyrudder, about six miles north of Larne, on the road to Glenarm. This deposit was examined long since by Dr. Jeffreys and the late Mr. George C. Hyndman, who published, in the Report af the British Association for 1859, a list of the shells which they found, at the same time intimating that their search was not exhaustive. It has also been recently mentioned by Mr. T. Mellard Reade, F.G.S., in Vol. XXXV. of

* Geol. Mag., Dec. 2. Vol. 3, p. 556.
† Geol. Mag., Dec. 2, Vol. 6, No. II.

the Quarterly Journal of the Geological Society of London. Mr. Reade apprehended the importance of this bed, and in his communication gives a section and interesting notes. The deposit at this place is well exposed, and differs much from those of the foregoing localities. It consists of gravel, with subordinate layers of sand and clay, the combined thickness of this series being about twenty feet. The gravels are overlaid by a bed of ordinary Boulder Clay, about ten feet thick. The base is not seen. The gravels can be traced along the road for some fifty or sixty yards, and yield a number of very interesting shells, univalves preponderating.

LIST OF THE MOLLUSCA OF THE NORTH-EAST OF IRELAND.

I gratefully acknowledge that in compiling this list I received valuable assistance from Dr. J. Gwynn Jeffreys. F.R.S., who, with his usual kindness, undertook the identification of such of my shells as were in any degree doubtful.

RHYNCHONELLA PSITTACEA. *Chemnitz.*

Ballyrudder, County Antrim, Jeffreys and Hyndman. Report Brit. Assoc., 1859.

ANOMIA EPHIPPIUM, *Linn.*

Belfast Waterworks. Bryce. Phil. Mag., Vol. XXVI., p. 433: Ballyrudder. Jeffreys and Hyndman.

OSTREA EDULE, *Linn.*

Belfast Waterworks. Bryce.

PECTEN MAXIMUS, *Linn.*

Belfast Waterworks. Bryce.

MYTILUS EDULIS, *Linn.*

Woodburn, Bangor, Ballyrudder, S. A. S.; Belfast Waterworks, Bryce; Ballyrudder, Jeffreys and Hyndman. In great abundance in a bed of stiff blue Boulder Clay on the banks of the Crumlin River.

MODIOLARIA MARMORATA, *Forbes.*

Ballyrudder, County Antrim, S. A. S.

NUCULA NUCLEUS, *Linn.*

Waterworks, Bryce; Woodburn, S. A. S.

LEDA PYGMÆA, *Munst.*

Knock, Woodburn, Ballyrudder, S. A. S. This tiny, delicate shell is not uncommon, and almost invariably found in a perfect state.

LEDA MINUTA, *Muller.*

Knock, Waterworks, Woodburn, Ballyrudder, S. A. S. Similarly to the preceding species, this shell is very often met with in a perfect state.

LEDA PERNULA, *Muller.*

Belfast Waterworks, Bryce; Falls Park, Waterworks, Woodburn, S. A. S. My largest specimen attained a breadth of one inch.

PECTUNCULUS GLYCIMERIS, *Linn.*

Belfast Waterworks, Bryce.

ARCA PECTUNCULOIDES, *Sacchi.*

Belfast Waterworks, S. A. S.

ARCA LACTEA, *Linn.*

Belfast Waterworks, Bryce.

LUCINA BOREALIS, *Linn.*

Woodburn, Ballyrudder, S. A. S.

CARDIUM ECHINATUM, *Linn.*

Belfast Waterworks, Bryce.

CARDIUM NODOSUM, *Turton.*

Belfast Waterworks, Bryce.

CARDIUM EDULE, *Linn.*

Belfast Waterworks, Bryce.

ASTARTE SULCATA, *Da Costa.*

Belfast Waterworks, Bryce; Bangor, Castle-Espie, Knock, Waterworks, Woodburn, Falls Park, S. A. S. This species and the following variety are to be found in almost every Bed of Boulder Clay. Frequently the shells are entire, but more commonly fragmentary. In the deposit at the Waterworks it is especially abundant.

ASTARTE SULCATA *var.* ELLIPTICA, *Brown.*

Belfast Waterworks, Bryce; Ballyrudder, Jeffreys and Hyndman; Knock, &c., S. A. S.

ASTARTE COMPRESSA, *Montagu.*

Belfast Waterworks, Bryce; Bangor, Falls Park, Woodburn, S. A. S.

ASTARTE COMPRESSA *var.* GLOBOSA, *Moller.*

Ballyrudder, Jeffreys and Hyndman.

ASTARTE TRIANGULARIS, *Montagu.*

I found one specimen only in the Boulder Clay at the Falls Park.

ASTARTE BOREALIS, *Chemnitz.*

Belfast Waterworks, G. C. Hyndman.

VENUS GALLINA, *Linn.*

Belfast Waterworks, Bryce; Bovevagh, County Derry, S. A. S.

VENUS OVATA, *Pennant.*

Belfast Waterworks, Bryce.

TAPES AUREUS, *Gmelin.*

Belfast Waterworks, Bryce.

TAPES DECUSSATUS, *Linn.*

Belfast Waterworks, Bryce.

TELLINA BALTHICA, *Linn.*

Belfast Waterworks, Bryce; Ballyrudder, Jeffreys and Hyndman; Falls Park, S. A. S.

TELLINA CALCAREA, *Chemnitz.*

Belfast Waterworks, G. C. Hyndman; Ballyrudder, Jeffreys and Hyndman.

MACTRA SUBSTRUNCTA, *Da Costa.*

Belfast Waterworks, G. C. Hyndman; Ballyrudder, Jeffreys and Hyndman, also S. A. S.

MACTRA SOLIDA *var.* TRUNCATA, *Montagu.*

Belfast Waterworks, Bryce.

MACTRA SOLIDA *var.* ELLIPTICA, *Brown.*

Belfast Waterworks, Bryce.

SCROBICULARIA PIPERATA, *Bellonius.*

Belfast Waterworks, Bryce.

MYA TRUNCATA, *Linn.*

Belfast Waterworks, S. A. S.

SAXICAVA RUGOSA, *Linn.*

Belfast Waterworks, Bryce.

SAXICAVA RUGOSA *var.* ARCTICA, *Linn.*

Falls Park, Waterworks, Woodburn, Ballyrudder, S. A. S.

PHOLAS PARVA, *Pennant.*

Ballyrudder, County Antrim, where I found one specimen. It is mentioned by Jeffreys as occurring in the Red crag, which is the only other British deposit in which it is found fossil, so far as I know.

PHOLAS CRISPATA, *Linn.*

Belfast Waterworks, fragments only, Bryce.

CHITON MARMOREUS, *Fabricius.*

Ballyrudder, S. A. S.

EMARGINULA FISSURA, *Linn.*

Belfast Waterworks, Bryce.

TROCHUS TUMIDUS, *Montagu.*

Belfast Waterworks, Bryce.

LACUNA PALLIDULA, *Da Costa.*

Belfast Waterworks, Bryce.

LACUNA DIVARICATA, *Fabricius.*

Ballyrudder, S. A. S.

LITTORINA LITOREA, *Linn.*

Belfast Waterworks, Bryce.

TURRITELLA TEREBRA, *Linn.*

Belfast Waterworks, Bryce; Knock and Ballyrudder, S. A. S.; Bovevagh, Co. Derry, Portlock. This is a rare shell in our Boulder Clay, except at Bovevagh, where I found it abundant in one spot, as recorded by General Portlock.

TURRITELLA EROSA, *Couthouy.*

Ballyrudder, Co. Antrim, Jeffreys and Hyndman.

NATICA MONTACUTI, *Forbes.*

Ballyrudder, Co. Antrim, Jeffreys and Hyndman.

NATICA AFFINIS, *Gmelin.*

Belfast Waterworks, Bryce: Ballyrudder, S. A. S.

APORRHAIS PES-PELICANI, *Linn.*

Belfast Waterworks, Bryce.

PURPURA LAPILLUS, *Linn.*

Belfast Waterworks, Bryce.

BUCCINUM UNDATUM, *Linn.*

Belfast Waterworks, Bryce; Ballyrudder, S. A. S.

BUCCINUM UNDATUM *var.* FUSIFORME.

Belfast Waterworks, Bryce.

BUCCINUM GRŒANLANDICUM *var.* UNDULATUM, *Moller.*

Ballyrudder, County Antrim, Jeffreys and Hyndman.

MUREX ERINACEOUS, *Linn.*

Belfast Waterworks, Bryce.

TROPHON CLATHRATUS, *Linn.*

Belfast Waterworks, Bryce; Bangor, S. A. S.; Ballyrudder, Jeffreys and Hyndman, also S. A. S.

TROPHON CLATHRATUS *var.* GUNNERI, *Loven.*

Falls Park, Belfast, S. A. S.

TROPHON TRUNCATUS, *Stromer.*

Belfast Waterworks, Bryce; Falls Park, Ballyrudder, S. A. S.

TROPHON LATERICEUS, *Moller.*

Woodburn, Co. Antrim, S. A. S.

FUSUS ANTIQUUS, *Linn.*

Belfast Waterworks, Bryce.

FUSUS ANTIQUUS *Monst.* CINCTUM.

Belfast Waterworks, Geo. C. Hyndman, S. A. S. I have seen two specimens of this form, which seems to me entitled to be considered as a variety rather than as a monstrosity.

FUSUS GRACILIS, *Da Costa.*

Belfast Waterworks, Bryce.

NASSA RETICULATA, *Linn.*

Belfast Waterworks, Bryce.

NASSA PYGMÆA, *Lamarck.*

Bangor, Co. Down, S. A. S.

NASSA INCRASSATA. *Stromer.*

Ballyrudder, Co. Antrim, S. A. S.

PLEUROTOMA TURRICULA, *Montagu.*

Ballyrudder, Co. Antrim, Jeffreys and Hyndman.

PLEUROTOMA DECUSSATA, *Couthouy.*

Ballyrudder, Co. Antrim, S. A. S.

PLEUROTOMA EXARATA, *Moller.*

Ballyrudder, Co. Antrim, S. A. S.

PLEUROTOMA PYRAMIDALIS. *Stromer.*

Ballyrudder, Co. Antrim, Jeffreys and Hyndman. Dr. Jeffreys thinks that this was the shell published as *Mangelia Pingelii* in Brit. Assoc. Report. It seems to me nearly certain that the correction is right.

CYPRÆA EUROPÆA, *Montagu.*

Bangor, Co. Down, S. A. S.

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APPENDIX VI.

A List

OF

RECENT FORAMINIFERA

OBTAINED DURING THE BELFAST NATURALISTS' FIELD CLUB'S EXCURSION TO

SOUTH DONEGAL,

August, 1880.

BY

JOSEPH WRIGHT, F.G.S.;

SPONGE REMAINS

FROM THE CARBONIFEROUS LIMESTONE OF BEN BULBEN, COUNTY SLIGO.

BY

JOSEPH WRIGHT, F.G.S.;

AND

FOSSIL SPONGE-SPICULES

FROM THE CARBONIFEROUS STRATA OF BEN BULBEN, NEAR SLIGO.

BY

H. J. CARTER, F.R.S., &c.,

Reprinted from "The Annals and Magazine of Natural History," for September, 1880.

Published by "The Belfast Naturalists' Field Club," April, 1882.

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1880-1881.)

FORAMINIFERA FOUND DURING THE BELFAST NATURALISTS' FIELD CLUB'S EXCURSION TO SOUTH DONEGAL, 1880.

Plate VIII. (upper half), figs. 1-5.

THE objects contemplated by the Club in visiting the Southern Coast of County Donegal embraced several departments of Natural Science, especially botany and geology, and as the time was limited it was impossible to devote much attention to dredging. Three shore gatherings, and four hauls of the dredge were, however, secured, and the present list is the result of an examination of material thus obtained. This list is not given as exhaustive of the locality visited, but simply as a contribution to our knowledge of the Irish rhizopodal fauna. It will also serve to indicate that rich results are likely to reward more systematic investigations in this quarter. Of the shore gatherings, that from Muckros was the only one which yielded a good supply of Microzoa. It was collected in a small sandy bay adjoining the singularly wild and remarkable precipices of Muckros Head. As is usual in the sandy bays open to the Atlantic, along our Western Coast *Truncatulina lobatula* greatly preponderated over all other forms. *Haplophragmium globigeriniforme*, *Lagena costata*, and *Polymorphina myristiformis* were large and abundant at Muckros, and also in the dredgings taken in the open sea, off the headlands of Slieve League, whilst the same forms were rare, and in poor condition in the more sheltered waters of Killybegs Harbour. The four dredgings from Killybegs and Slieve League might, with little disadvantage, have been recorded as from two stations. For example, the two gatherings from Killybegs, one taken in seven fathoms water, inside the harbour, the other in seventeen fathoms, a few hundred yards outside the Lighthouse, were very similar, both in nature of bottom and foraminiferous yield. The material dredged at both places was soft turfy ooze, yielding Microzoa in great profusion, and differing merely in that the one gathered outside the Light-

house was somewhat more sandy, and yielded a larger number of species. *Bulimina*, *Bolivina*, and *Cassidulina* were the characteristic genera at both places. The two gatherings taken off Slieve League differed scarcely in any particular.

I have taken advantage of the present opportunity to record (under column 8) a list of species found in a dredging taken off Portstewart, by my friend Mr. James Wright, and kindly sent by him to me for examination.

I am deeply indebted to my friend Mr. H. B. Brady, F.R.S., who, with his usual kindness, has examined and named the critical species; as also to my friend Mr. W. Swanston, F.G.S., for the accurate and artistic drawings of the Foraminifera which accompany this memoir.

I append a few remarks on one or two of the forms of more special interest.

HAPLOPHRAGMIUM GLOMERATUM, *Brady*. (Plate viii, figs, 1, 1*a*.)

Lituola glomerata, Brady, 1878, Ann. and Mag. Nat. Hist. Ser. 5, vol. 1, p. 433, Pl. xx. fig, 1 *a*, *b*, *c*.

This simple little *Haplophragmium* is abundant in Killybegs Harbour. It was also dredged last year by Mr. David Robertson, F.L.S., off the Isle of Skye, being the first record of its occurrence in British waters. The Irish examples are not so coarse in texture as the type specimens from the Arctic seas, figured by Mr. Brady.

AMMODISCUS SHONEANA, *Siddall*.

Trochammina Shoneana, Siddall, 1878, Proc. Chester. Soc. Nat. Sci., part 2, p. 46.

A few examples of this pretty little *Ammodiscus* were found off Killybegs Harbour. It has hitherto been only met with in the Estuary of the Dee, by Mr. J. D. Siddall; and in Belfast Lough, by Dr. Malcomson.

GAUDRYINA FILIFORMIS, *Berthelin*. (Pl. viii. figs, 3, 3*a*, 3*b*.)

Gaudryina filiformis, Berthelin, 1880, Mem. Soc. Geol. France, Ser. 3, Vol. 1. Mem. No. 5, p. 25, pl. 1, fig, 8, *a—d*.

An elongated sandy *Gaudryina*, with later chambers subquadrate. Often in a fragmentary state, the loose sandy texture of its test making it liable to be easily broken. Well-grown perfect examples are not unfrequent off Killybegs. It has been found at many stations round our Irish Coasts; also off Skye, by Mr. Robertson.

BULIMINA SUBTERES, *Brady, M.S.* (Pl. viii. figs, 2, 2*a*.)

Bulimina subteres, Brady, 1880, Notes on Reticularian Rhizopoda of the Challenger Expedition—Quart. Journ. Micr. Sci., Vol. xxi, New Series. p. 25.

Fine examples of this handsome *Bulimina* are not unfrequent off Killybegs Harbour. It has also been found off Skye, by Mr. Robertson, and off the Shetlands, by Mr. Brady.

LAGENA MARGINATA, *Walker & Jacob.* (Pl. viii. figs, 4, 4*a*.)

Serpula (Lagena) marginata, Walker & Jacob, 1784. Test. Min. p. 3, pl. 1, fig, 7.

Examples similar to Walker & Jacob's type, having a broad marginal keel of transparent shell substance, are not unfrequent round our coasts. Rare off Killybegs Harbour, seventeen fathoms.

LAGENA MARGINATA *var.* ORBIGNYANA, *Seguenza.* (Pl. viii. figs, 5, 5*a*.)

Fissurina Orbignyana, Seguenza, 1862, Foram, Monotal. Mess. p. 66, pl. 2, figs, 25, 26.

This well-marked variety, with three keels, is abundant almost everywhere round our coast. It is plentiful in all the Donegal gatherings.

LAGENA COSTATA, *Williamson.*

Entosolenia costata, 1858, Rec. For. Gr. Br. p. 9, pl. 1, fig, 18; Wright, Proc. Belfast Nat. Field Club—app. 1876-7, pl. 4, figs, 11—14.

I have remarked that, of all our British *Lagenæ*, this form appears to flourish best off the exposed parts of our coasts. I imagine this must be due to its strong test enabling it to thrive better in rough water than the other more delicately formed species. Frequent off Slieve League.

Fragments of a long, slender, tapering, arenaceous form, consisting of a number of segments, and having its shell-wall frequently composed of closely-fitting sponge spicula, arranged side by side, are not unfrequent off Slieve League, as well as at other stations round our coast. It is, most probably, a *Reophax*, but as no perfect example has as yet been obtained, its place among the Foraminifera could not be given with any degree of certainty.

LIST OF LOCALITIES, WITH PARTICULARS OF DEPTH, &c.

	LOCALITIES.	Bathymetrical Range.	Sea Bottom.	Relative quantities of material examined.	Number of species from each locality
1	DONEGAL; about half-a-mile from the town of Donegal, on the Southern side of the Bay; tide about half out when the gathering was taken.	Between tides.	Muddy sand	6½ lbs	34
2	ARDARA; rock pools near the town; *Polystomella striato-punctata* abundant, with tests, very thin.	ditto.	A soft oozy mud, with offensive smell. ...	10 lbs	31
3	MUCKROS BAY; about six miles W. of Killybegs: *Truncatulina lobatula* in great profusion. ...	ditto.	Sand.	6½ lbs	69
4	Between Slieve League and Malinbeg; three-fourths mile off land	24 fms. ...	Sand.	11 lbs	62
5	Off Slieve League; one and a half miles off land.	34 fms. ...	Sand.	6 lbs	67
6	KILLYBEGS HARBOUR.	7 fms. ...	Soft, turfy ooze. ...	5 lbs	82
7	Off Killybegs Harbour; a few hundred yards outside the Lighthouse.	17 fms. ...	Turfy ooze, and sand ...	12½ lbs	101
8	Off Portstewart; one mile off land.	15 fms. ...	Sand.	——	76

TABLE SHOWING THE DISTRIBUTION OF FORAMINIFERA GATHERED DURING THE BELFAST NATURALISTS' FIELD CLUB'S EXCURSION TO SOUTH DONEGAL, 1880.

ABBREVIATIONS:—v r, very rare; r, rare; c, common; v c, very common. Species marked * are new to the British Fauna. Figures in column marked † refer to plate VIII accompanying this paper.

LIST OF SPECIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg,—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portstewart,—15 fms.
	†	1	2	3	4	5	6	7	8
CORNUSPIRA, *Schultze.*									
involvens, *Reuss*	...	...	...	r	r	r	r	r	r
foliacea, *Philippi*	...	...	...	...	...	...	...	v r	...
BILOCULINA, *D'Orb.*									
ringens, *Lamk.*	...	...	...	c	r	r	v c	c	r
depressa, *D'Orb.*	...	...	...	c	r	r	r	r	c
elongata, *D'Orb.*	...	v r	...	...	r	...	r	r	...
sphæra, *D'Orb.*	...	...	..	c	...	...	...	...	r
MILIOLINA, *Will.*									
trigonula, *Lamk.*	...	...	...	...	...	r	r	r	r
tricarinata, *D'Orb.*	...	...	...	r	...	r	r	r	r
oblonga, *Montagu*	...	...	...	r	...	r	r	r	r
Brongniartii, *D'Orb.*	...	...	...	r	...	...	r	r	r
seminulum, *Linn.*	...	r	...	c	c	c	v c	v c	c
subrotunda, *Montagu*	...	...	r	c	c	c	c	c	v c
secans, *D'Orb.*	...	...	v r	c	r	...	...	v r	c
bicornis, *W. & J.*	...	...	v r	c	v c	c	r	r	c
Ferussacii, *D'Orb.*	...	...	...	r	r	...	v r	r	r
fusca, *Brady*	...	r	c	...	...	...	...	...	...
SPIROLOCULINA, *D'Orb.* ...									
limbata, *D'Orb.*	...	...	...	r	r	r	r	r	r
planulata, *Lamk.*	..	...	...	...	r	r	r	r	v r
PSAMMATODENDROM, *Norman, M.S.*									
arborescens, *Norman, M.S.*, fragment	...	...	...	...	...	...	...	...	v r

TABLE—Continued.

LIST OF LOCALITIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg,—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portstewart,—15 fms.
	†	1	2	3	4	5	6	7	8
REOPHAX, *Montfort.*									
fusiformis, *Will.*	...	..	...	...	...	...	...	v r	...
scorpiurus, *Montfort*	...	...	...	...	..	...	r	r	...
HAPLOPHRAGMIUM, *Reuss.*									
globigeriniforme, *P. & J.* ..	..	...	...	c	v c	c	r	r	v c
glomeratum, *Brady*	Fig1	...	...	...	v r	v r	r	v c	...
pseudospirale, *Will.*	...	...	...	...	..	...	r	r	...
Canariense, *D'Orb.*	...	...	v r	c	c	c	r	r	c
AMMODISCUS, *Reuss.*									
incerta, *D'Orb.*	...	...	...	...	...	...	r	r	...
gordialis, *J. & P.*	...	...	...	r	...	r	r	r	v r
Shoneana, *Siddall*	...	...	...	...	...	..	...	r	..
TROCHAMMINA, *P. & J.*									
squamata, *P. & J.*	...	...	...	v r	...	r	r	r	r
inflata, *Montagu*	...	r	v r	...	...	...	...	...	...
TEXTULARIA, *Defrance.*									
sagittula, *Defrance*	...	...	r	c	c	c	c	c	c
agglutinaus, *D'Orb.*	...	...	...	...	r	...	...	...	...
trochus, *D'Orb.*	...	...	...	...	...	...	...	v r	...
difformis, *Will.*	...	r	..	c	r	r	r	r	r
GAUDRYINA, *D'Orb.*									
*filiformis, *Berthelin.*	Fig3	...	..	v r	...	v r	v c	v c	v r
VERNEUILINA, *D'Orb.*									
polystropha, *Reuss*	..	v r	.	...	v r	r	v c	r	...
BULIMINA, *D'Orb.*									
pupoides, *D'Orb.*	...	c	r	c	c	c	v c	v c	c
marginata, *D'Orb.*	...	v r	v r	r	...	v r	c	v c	r
aculeata, *D'Orb.*	...	...	...	...	..	...	c	v c	...
ovata, *D'Orb.*	..	c	r	c	r	r	v c	v c	r
elegantissima, *D'Orb.* ...	...	v r	..	r	v r	...	c	c	..
*subteres, *Brady*	Fig2	...	...	v r	...	..	r	r	v r
VIRGULINA, *D'Orb.*									
Schreibersii, *Czjzek*	...	v r	...	...	...	...	c	v c	...
BOLIVINA, *D'Orb.*									
dilatata, *Reuss*	...	v r	r	r	r	r	c	v c	...
punctata, *D'Orb.*	...	v r	...	r	...	v r	c	v c	v r
plicata, *D'Orb.*	...	r	r	c	r	r	c	v c	r

TABLE—Continued.

LIST OF LOCALITIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg,—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portstewart,—15 fms.
	†	1	2	3	4	5	6	7	8
CASSIDULINA, *D'Orb.*									
lævigata, *D'Orb.*	...	v r	...	c	r	r	c	c	r
crassa, *D'Orb.*	...	v r	v r	c	r	r	c	c	r
oblonga, *D'Orb.*	...	...	..	...	...	...	r	r	...
Bradyi, *Norman M.S.*, broken.	...	...	...	...	...	...	...	...	v r
LAGENA, *Walker and Jacob.*									
sulcata, *W. & J.*	...	r	r	c	...	r	r	c	c
costata, *Will.*	...	..	r	c	v c	c	v r	r	c
Williamsoni, *Alcock*	...	c	c	c	c	c	c	c	v c
Lyellii, *Seguenza*	...	...	...	...	...	...	...	r	..
lævis, *Montagu*	...	c	c	c	r	c	c	c	c
gracillima, *Seguenza*	...	...	...	...	...	...	c	c	...
globosa, *Montagu*	...	...	v r	r	r	r	v r	r	r
striata, *D'Orb.*	...	v r	..	...	r	r	c	v c	...
striato-punctata, *P. & J.* ...	...	...	...	...	...	...	...	r	...
gracilis, *Will.*	...	...	...	...	...	c	r	c	...
semistriata, *Will.*	...	r	...	c	r	c	c	c	r
hispida, *Reuss*	...	...	...	...	...	...	...	r	...
aspera, *Reuss*	...	...	...	...	...	...	...	r	...
caudata, *D'Orb.*	...	r	...	r	...	r	r	r	r
marginata, *W. & J.*	Fig4	...	...	...	...	...	r	r	r
var. Orbignyana, *Seguenza*...	Fig5	c	c	c	c	c	c	c	c
var. trigono-marginata, *P. & J.*	...	...	...	...	v r	...	...	v r	r
lucida, *Will.*	...	c	c	c	r	c	c	c	c
var. (trigono-) oblonga, *Seguenza*	...	...	...	...	...	...	...	r	...
pulchella, *Brady*	...	...	..	v r	...	v r	...	v r	..
ornata, *Will.*	...	...	...	...	...	...	r	r	...
lagenoides, *Will.*	...	...	...	...	...	...	...	r	...
squamosa, *Montagu*	...	c	c	c	c	c	c	c	c
hexagona, *Will.*	...	r	c	r	r	r	c	r	c
LINGULINA, *D'Orb.*									
carinata, *D'Orb.*, small ...	...	...	...	...	...	...	...	v r	...
*tenera, Bornemann (fossil ?)...	..		...		...	...	.	...	v r

TABLE—Continued.

LIST OF LOCALITIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg,—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portstewart,—15 fms.
	†	1	2	3	4	5	6	7	8
NODOSARIA, *Lamk.*									
scalaris, *Batsch.*	...	...	...	v r	...	...	c	c	v r
pyrula, *D'Orb.*, and dentaline variety	...	...	...	...	...	...	r	r	r
VAGINULINA, *D'Orb.*									
legumen, *Linn.*, small ...	...	...	...	...	...	v r	r	r	...
MARGINULINA, *D'Orb.*									
lituus, *D'Orb.*, small	...	...	...	...	...	...	...	r	...
CRISTELLARIA, *Lamk.*									
rotulata, *Lamk.*	...	...	...	r	...	...	r	r	v r
crepidula, *F. & M.*	...	...	...	r	r	r	v r	r	v r
POLYMORPHINA, *D'Orb.*									
lactea, *W. & J.*	...	r	...	r	...	r	...	...	r
gibba, *D'Orb.*	...	r	...	c	c	c	r	r	c
oblonga, *Will.*	...	...	...	r	r	...	r	r	r
compressa, *D'Orb.*	...	...	...	c	r	c	r	c	r
concava, *Will.*	...	...	...	...	...	...	...	v r	...
myristiformis, *Will.*, large ..	...	...	...	c	c	c	...	r	...
communis, *D'Orb.*	...	...	...	...	...	v r	...	...	...
UVIGERINA, *D'Orb.*									
angulosa, *Will.*	...	v r	r	c	r	r	c	r	r
ORBULINA, *D'Orb.*									
universa, *D'Orb.*	...	...	v r	...	r	v r	...	...	...
GLOBIGERINA, *D'Orb.*									
bulloides, *D'Orb.*	...	c	v c	c	r	c	r	r	v c
inflata, *D'Orb.*	...	...	...	v r	...	r	...	v r	r
SPIRILLINA, *Ehrenb.*									
vivipara, *Ehrenb.*	...	...	...	v r	...	r	...	r	v r
PATELLINA, *Will.*									
corrugata, *Will.*	...	...	v r	r	v r	...	c	c	v r
DISCORBINA, *P. & J.*									
rosacea, *D'Orb.*	...	...	...	c	r	r	c	r	c
Parisiensis, *D'Orb.*	...	...	...	...	...	...	...	v r	v r
*Wrightii, *Brady*	...	...	...	c	r	...	...	...	v r
Globularis, *D'Orb.*	...	...	...	v c	v c	v c	c	c	c
Bertheloti, *D'Orb.*	...	...	...	v r	...	...	r	r	v r

TABLE—Continued.

LIST OF LOCALITIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg.—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portstewart,—15 fms.
	†	1	2	3	4	5	6	7	8
PLANORBULINA, *D'Orb.*									
Mediterraneensis, *D'Orb.* ...	...	...	...	c	c	r	c	c	c
TRUNCATULINA, *D'Orb.*									
lobatula, *Walker*	...	v c	v c	v c	v c	v c	v c	v c	v c
refulgens, *Montfort*	...	...	...	...	c	v r	...	..	...
TINOPORUS, *Montfort*									
lævis, *P. & J.*	...	...	...	...	r	v r	..	...	...
lucidus, *Brady*	...	...	v r	c	c	r	r	...	r
PULVINULINA, *P. & J.*									
repanda, *F. & M.*, small ...	...	...	...	...	r	...	...	...	r
auricula, *F. & M.*	...	...	...	r	c	r	...	...	r
Karsteni, *Reuss*, small ...	...	...	...	...	...	...	r	v r	...
ROTALIA, *Lamk.*									
Beccarii, *Linn.*	...	c	..	v r	r	...	c	v c	c
nitida, *Will.*	...	...	v r	c	r	r	c	c	c
OPERCULINA, *D'Orb.*									
ammonoides, *Gron.*, large ...	...	...	...	...	v r	..	r	r	...
POLYSTOMELLA, *Lamk.*									
crispa, *Linn.*	...	..	...	c	r	r	c	r	r
striato-punctata, *F. & M.* ...	...	v c	v c	c	r	c	v c	v c	c
NONIONINA, *D'Orb.*									
turgida, *Will.*	...	..	...	r	r	r	v c	v c	r
depressula, *W. & J.*	...	v c	v c	c	r	r	r	r	c
scapha, *F. & M.*, small ...	...	...	...	...	...	...	...	...	v r
umbilicatula, *Montagu* ...	...	...	...	...	...	...	r	c	...
stelligera, *D'Orb.*	...	v r	...	...	...	...	v r	r	r

(*Proceedings Belfast Naturalists' Field Club.—Appendix*, 1880-1881.)

SPONGE REMAINS FROM THE CARBONIFEROUS LIMESTONE OF BEN BULBEN, CO. SLIGO.

BY JOSEPH WRIGHT, F.G.S.

(*Read before the Belfast Naturalists' Field Club, on the* 13*th April*, 1881.)

AFTER referring briefly to the several groups of sponges, and their position in the animal kingdom, Mr. Wright proceeded to say, that having examined a portion of a pale yellow clay, which had been procured near the summit of Ben Bulben Mountain by Mr. S. A Stewart, he found that it contained an abundance of sponge-spicules, this being the only instance of such remains having been found in Ireland in rocks of Carboniferous age. In company of Mr. Stewart he had visited the spot for the purpose of ascertaining the mode of occurrence of the sponge remains, and to procure a sufficient quantity of the material for his investigations. Ben Bulben is a grand mountain, 1,722 feet high, whose stupendous cliffs arrest the attention of the traveller on the way from Bundoran to Sligo. The rock here may truly be called mountain limestone, the entire range, of which Ben Bulben is the most conspicuous, being composed of Carboniferous Limestone from the base to the summit. Nowhere else in Ireland do the Carboniferous rocks attain so great an elevation. Two days were spent on Ben Bulben, an ample supply of the fossiliferous clay obtained, and also many rare fossils met with in the limestone. Crinoids were especially abundant, notably the pretty little *Pentremites Derbiensis*. The curiously branched coral, *Cladochonus baccilaris*, was seen at one spot in great masses in the stone. The clay in question has been under examination, and already has yielded eleven different forms of sponge-spicules. Of these, four belong to the calcareous sponges, two to the Lithistidæ, and the remaining five to the group of the Hexactinellidæ. Three of these last-mentioned are extremely beautiful forms, being spirally ringed spicules apparently referrible to one species of sponge, and new to science. Mr. Wright further mentioned that some of the clay had been submitted to his friend, Mr. James Cooke, of Cork, for chemical analysis, and was found to be

almost purely silicious. Mr. Cooke regards it as disintegrated chert, the disintegrating agent being animal life. The following is Mr. Cooke's analysis:—Silica, soluble and insoluble, 97 to 98 per cent.; alumina, with sesquioxide of iron, 1 per cent.; lime, less than 1 per cent.; traces of magnesia and manganese, 1-10 per cent. Mr. Cooke finds clear proof of organic matter still existing in the clay, and he considers that the silica was probably supplied by some volcanic outburst. In the "rotten limestone" of Cunningham Baidland, Ayrshire, which seems to resemble our Ben Bulben clay, sponge-spicules are abundant, and very similar to those found in Sligo. In the Irish, as in the Scotch beds, chert occurs associated with the clays in which the spicules are found. This is similar to what occurs in our Cretaceous rocks, and points to the fact of the silica which forms our flints and chert having been, in part at least, derived from silicious sponges which abounded in ancient seas, the silica being redeposited in layers, or concentrated round some sponge or other organism, and so forming our nodular flints. The paper was illustrated by a fine series of diagrams representing the various forms of spicules obtained in the Sligo mountains, as well as the material in which they were found. Several examples of recent and fossil sponges were also exhibited at the close of the meeting.

Through the kind permission of Mr. H. J. Carter, F.R.S., the following paper, "On fossil sponge-spicules from the Carboniferous strata of Ben Bulben," has been reprinted from the Annals and Magazine of Natural History, Sept., 1880; the figures which accompanied it have been reproduced by photo-lithography, and are an exact reproduction of the originals.

(*From the* Annals and Magazine of Natural History *for Sept.*, 1880.)

ON FOSSIL SPONGE-SPICULES FROM THE CARBONIFEROUS STRATA OF BEN BULBEN, NEAR SLIGO.

BY H. J. CARTER, F.R.S., &c.

Plate VIII., (lower half) figs. 1-17.

IN the last contribution that Mr. James Thomson made to our knowledge of fossil sponges which existed during the Carboniferous epoch in the neighbourhood of Glasgow ('Annals,' 1879, vol. iii., p. 141, pl. xxi.), I described and illustrated *Holasterella conferta*, a genus of sponges, as the name indicates, exclusively composed of stelliform spicules, whose typical figure, from the same locality, had been found and illustrated a year previously. At the same time I added (*ibid.* p. 145) some observations on specimens of

limestone belonging to the Carboniferous series which Mr. Thomson had gathered from the western side of Black Head, county Clare, at the southern extremity of the entrance to Galway Bay, in which the siliceous element (often present in great quantity) seemed to indicate that it had been derived from some organisms more or less composed of silica, especially as in other parts, where the limestone is pure, the remains of sponge-spicules in a calcified state are abundantly recognizable, although in none of the specimens sent to me could I find a *definite* form.

Here the matter rested, so far as I myself was concerned; but Mr. Joseph Wright, F.G.S., who resides at Belfast, having subsequently visited the mountain near Sligo called "Ben Bulben," actually ascertained the presence of several forms of sponge-spicules in the limestone of the Carboniferous system there, and kindly forwarded specimens of them to me, together with fragments of the strata in which they are found, for description and illustration. But before I proceed to this, it is desirable that the following extracts from Mr. Wright's letter, dated Jan. 1, 1880, which accompanied them, should be given, viz.:—

"Last summer my friend Mr. S. A. Stewart spent a few days botanizing on Ben Bulben, and, whilst there, observed soft clay bands in the limestone, of which he brought me three different 'gatherings' to examine for Foraminifera, viz.:—1, containing no organisms; 2, a few Foraminifera and spicules; and 3, rich in sponge-spicules.

"The last material proved so interesting that we afterwards visited the place in company and brought away a quantity of the clay. It is of a pale yellowish colour, and occurs interstratified with bands of chert, especially at the summit of the mountain, where it is very soft, owing, apparently, to exposure to the weather; on the other hand, lower down, the same yellow material occurs, but much harder, although lighter, from its open pumice-like structure. At both places we found a great number of fossils belonging to the limestone of the Carboniferous system, viz. . . . . .

"I sent some of the clay to a friend in Cork for analysis; and he has informed me that it contains 98 per cent. of silica."

After this follow sketches of all the forms of fossil sponge-spicules that Mr. Wright by dexterous manipulation was enabled to extricate from the clay—to which, after carefully looking over all that he found, which were subsequently forwarded to me, I can add no more specifically, although I have been able to find a few with slightly different forms, which have assisted me in the following descriptions. Of course, as drift-spicules, which these must have been when originally deposited, to say nothing of the subsequent effects of fossilization, &c., they are nearly all fragmentary; but sufficient of them remains for easy recognition and for restoration, as will be seen by the illustrations.

First and foremost is a sexradiate stellate (Pl. XIV. B. fig. 2), which in

number of rays varies from 6, 12, 18 to 24 (figs. 4-7), according to the amount of division of the extremities of six arms. The stellates vary in size from 1-75th to 5-24ths of an inch (fig. 1) in diameter; and the smallest are not only the most numerous and have the greatest number of rays, but, as the latter often arise from a division of the arm close to the centre, they acquire the appearance of globular little stars; while, where the arms are a little more extended, they often present the appearance of a "Maltese cross." But the most striking feature of this spicule is that, from the smallest to the largest, each ray is spiriform; that is, its surface presents a spiral inflation in which the coils are more or less numerous, extending from the base to the apex of the ray (figs. 2 and 3); where they are most numerous they, of course, are more transverse, and then appear like separate annulations; while the most remarkable difference in them is confined to the rays of the largest stellates, where, towards the base, the spiral line of inflation becomes broken up into short portions (fig. 3 *b*), which look very much, from their alternate arrangement in adjoining coils, as if this had been produced by another spiral groove pursuing an opposite direction (that is, across the original inflation).

This fossil spicule is incomparably more numerous than the other spicular forms accompanying it; so that, together with its peculiarities *being confined to a stellate form*, I am compelled to think that it must have belonged to a species of *Holasterella* which, if found *in situ* hereafter (that is, forming the entire sponge), will be like *H. conferta*; hence I have much pleasure in naming it *Holasterella Wrightii*, after its discoverer.

The next spicule in frequency appears to have been a hexactinellid, with the sixth or external arm not produced as in the large surface-spicules of the Sarcohexactinellida, in which four arms are extended over the surface laterally, while the fifth, like the shaft of a nail, goes vertically inwards (fig. 8). With this, and also equally plentiful, are the free ends of "anchoring-spicules" terminated by four much-recurved spines or flukes situated opposite each other, and still attached to a small fragment of the shaft (fig. 9), longer and larger portions of which may be observed in the "chert," both longitudinally and in transverse sections under fracture, indicating that with the anchoring ends they are the fragmentary remains of what originally were anchoring- or cord-spicules of a *Hyalonema* or Sarcohexactinellid sponge.

Tolerably numerous also are Lithistid spicules, especially one like a tripod, in which the centre is convex and smooth, while the three legs, bending outwards and downwards, end respectively in expanded concave feet, which seem to show that they were once applied to similar surfaces on adjoining spicules (figs. 10 and 11). This in all probability was a surface-spicule like those of *Corallistes aculeata* ('Annals,' 1880, vol. vi. pl. vii. fig. 45). Fragments of other Lithistid spicules are also present, such as the dendritically branched surface-spicule (fig. 12), and the shafted one of the fully developed or internal structure (fig. 13).

To these may be added a sausage-shaped spicule like that of some of the *Renieræ* of the present day, also tolerably plentiful (fig. 14); and other fusiform acerate ones (figs. 15 and 16), which being common to many kinds of sponges, cannot in their isolated state, be identified with any in particular.

Two fragments represent the arms of a quadriradiate spicule (fig. 17); but whether these were equal in length, or one was prolonged into a shaft, there is no evidence to show: if the former, it probably belonged to one of the Pachastrellina; if the latter, to a zone-spicule of one of the Pachytragida.

The most interesting part of this discovery, however, is that the "clay" of Ben Bulben, in which Mr. Wright found these remains, is apparently identical in every respect with that sent me by Mr. James Thomson, in which he found *Holasterella conferta*, near Glasgow. In both instances isolated sponge-spicules of different kinds are disseminated through it, which can be obtained by edulcoration with water, and are composed of silica in an opaque or chalcedonic state, rendered more or less irregular by the presence of rhomboidal excavations on the surface.

Here I might observe that, not only are the sponge-spicules, and the minute fossils of the Carboniferous Limestone which accompany them, silicified and pitted on the surface with the same kind of rhomboidal excavations, but the "chert" to which Mr. Wright has alluded appears to be a solid pseudomorph of the limestone; for its pumice-like worm-eaten character occurring here and there, from partial absorption or decomposition of the material, presents a skeletal rhomboidal structure; while the same kind of rhomboidal excavations characterize the surface of the weather-worn *calcareous* fossils in the *pure Devonian Limestone* of this neighbourhood; by which I am led to infer that, in the first place, the sponge-spicules become partially or wholly calcified among *calcareous* material, else why should they now present rhomboidal excavations on their surface? that subsequently the siliceous element, being liberated, replaced the calcareous material so as to form the "chert;" and, thirdly, that the rhomboidal excavations on the surface of the spicules and the partial absorption of the spicules themselves, leaving nothing but their moulds, arises from the changes which the siliceous element itself is now undergoing—that is, becoming decomposed and removed, or passing from an amorphous state into clear quartz prisms. The latter, although but slightly the case, comparatively, in the specimens from Ben Bulben, is characteristically so in the specimens to which I have alluded from Black Head, Co. Clare, wherein not only geodic cavities lined with quartz prisms, but perfect prisms themselves are present, imbedded in the amorphous siliceous material composing the rock, while all satisfactory traces of sponge-spicule form in these parts is entirely absent, so far as the specimens sent to me indicated.

Lastly, I am inclined to think that the "clay" of Ben Bulben is the "chert" decomposed, and that the innumerable fragments of sponge-spicules which are present in the latter (for in some parts the chert appears to be almost entirely

composed of them), rendered still more fragmentary by partial removal so as to leave nothing but their moulds, as before stated, are those which at last come out entire, so far as they go, in the washing of the "clay."

It is remarkable, too, that by far the most plentiful among Mr. Thomson's collection of spicules from the clay near Glasgow is that of *Holasterella conferta*, as it is that of *H. Wrightii* at Ben Bulben; the "sausage-shaped" spicule (fig. 14) is also analogous to that of the supposed Renierid sponge ('Annals,' 1879, vol. iii. pl. xxi. fig. 11), and about the same in frequency. In Mr. Thomson's collection were also fragments of Lithistid spicules; and last summer he sent me a section of an entire sponge in Carboniferous Limestone, all calcified, with weathered-out spicules on the surface, but none of it sufficiently defined for useful delineation. The collection also contained some zone-spicules of the Pachytragida; so that, altogether, the Spongida appear to have been as plentiful and as varied in the Carboniferous age as at any other time.

It would be worth while, when the opportunity offers, for some one to look over the weathered surface of the strata in the mountain of Ben Bulben, where fragments, if not entire specimens, of sponges from which the spicules come might be found, after the manner that they have been discovered in the Carboniferous system in the south-west of Scotland.

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BRITISH MUSEUM NATURAL HISTORY

EXPLANATION OF PLATE VIII. (Upper Half.)

FIG. 1. *Haplophragmium glomeratum*, Brady, magnified 60 diam. Off Killybegs Harbour, 17 fms.

FIG. 2. *Bulimina subteres*, Brady, magnified 60 diam. Off Killybegs Harbour, 17 fms.

FIG. 3. *Gaudryina filiformis*, Berthelin, magnified 60 diam. Off Killybegs Harbour, 17 fms.

FIG. 4. *Lagena marginata*, W. & J., magnified 60 diam. Off Killybegs Harbour, 17 fms.

FIG. 5. *Lagena marginata*, var. *Orbignyana*, Seguenza, magnified 60 diam. Off Killybegs Harbour, 17 fms.

EXPLANATION OF PLATE VIII. (Lower Half.)

FIG. 1. *Holasterella Wrightii*, spicule of, nat. size. The largest met with (diagram).

FIG. 2. The same, restored, to show the perfect form with spiral inflation on the arms. Magnified 7 diameters.

FIG. 3. The same. Furcate arm, much more magnified, to show—*a*, the simple spiral inflation, and *b*, the same when "broken up." Scale 1-48th to 1-1800th inch.

FIGS. 4, 5, 6, and 7. The same, to show the simple sexradiate and multifid divisions of the arms respectively (diagrams).

FIG. 8. Sarcohexactinellid. Fragment of large surface-spicule of unknown species.

FIG. 9. The same. Free end of anchoring-spicule.

FIG. 10. Lithistid. ? Tripod-like surface-spicule of unknown species.

FIG. 11. The same. Lateral view.

FIG. 12. The same. Dendritically branched surface-spicule of unknown species.

FIG. 13. The same. Form of body-spicule of unknown species.

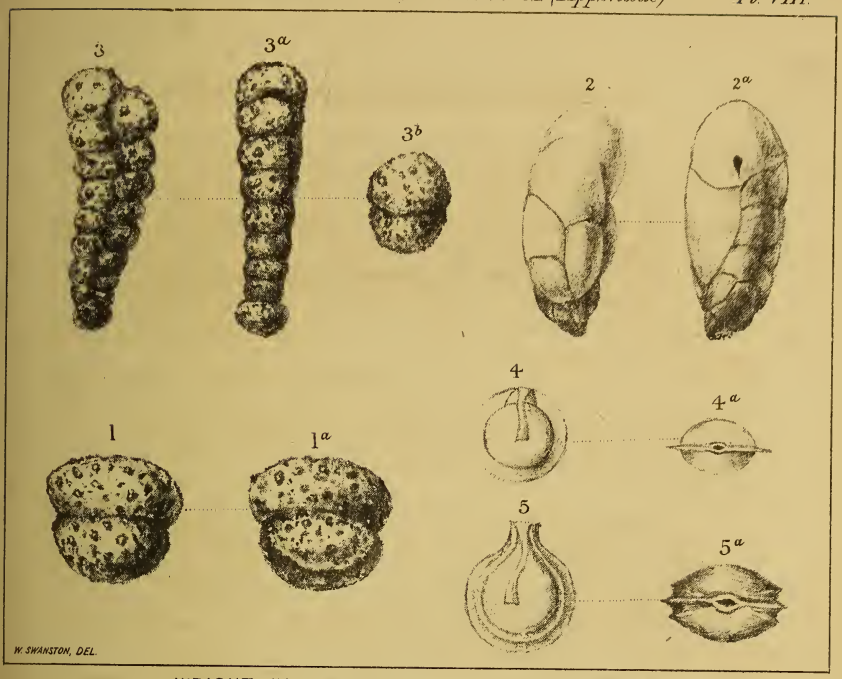
FIG. 14. *Reniera* ?. Sausage-shaped spicule of unknown species.

FIG. 15. Acerate spicule of unknown sponge.

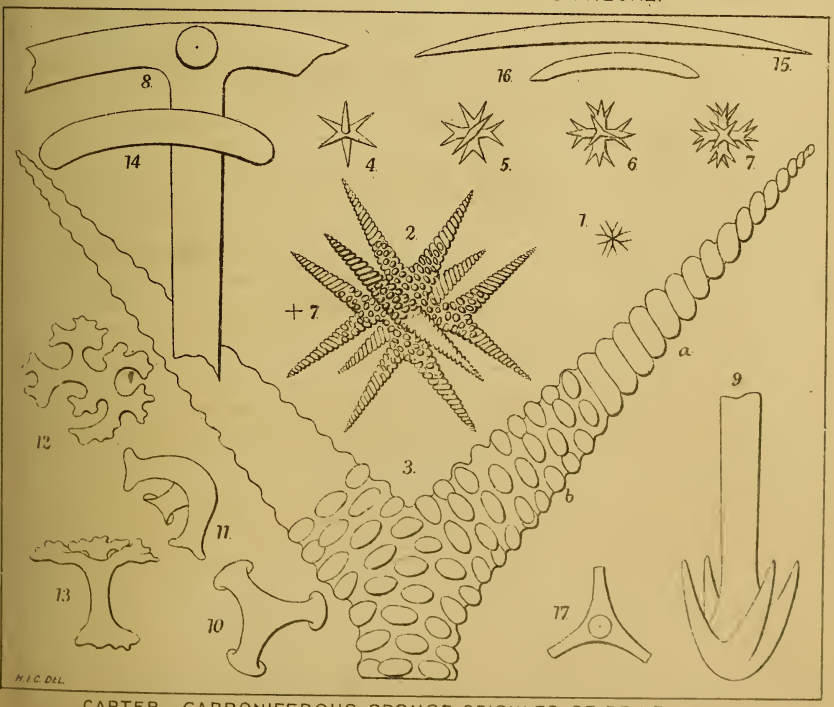
FIG. 16. The same.

FIG. 17. Quadriradiate fragment of spicule of unknown sponge.

N.B.—Figs. 3 and 8-17 inclusively are all drawn to the scale of 1-48th to 1-1800th inch.



WRIGHT - FORAMINIFERA OF SOUTH DONEGAL.



CARTER - CARBONIFEROUS SPONGE SPICULES OF BEN BULBEN.

BRITISH MUSEUM

As it is intended to issue, from time to time, further Lists of the Fauna, Flora, Fossils, and Antiquities of the North of Ireland, Members are requested to preserve this Appendix for binding with those already issued, and to be issued in the future.

The next part of the Proceedings will contain Drawings, Illustrating Papers by Mr. William Gray, and Mr. Charles Elcock, abstracts of which appear in this part.

APPENDIX VII.

SUPPLEMENT

TO A

LIST OF MOSSES

OF THE

NORTH-EAST OF IRELAND.

BY

SAMUEL ALEX. STEWART,
Fellow of the Botanical Society of Edinburgh.

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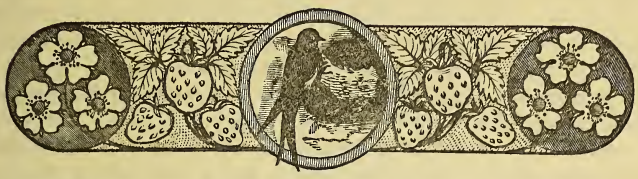

SUPPLEMENT

TO A LIST OF THE MOSSES OF THE NORTH-EAST OF IRELAND.

BY SAMUEL ALEX. STEWART,

Fellow of the Botanical Society of Edinburgh.

NINE years have passed away since the list, to which this is a supplement, was published in the Proceedings of the Belfast Naturalists' Field Club. During that period the world has not failed to move on, nor has botanical knowledge stood still. Stimulated mainly by the Royal Irish Academy, a number of Irish naturalists have been scrutinising narrowly the flora of their country. The results of these investigations have been embodied in valuable reports published, or now being published, in the Proceedings of the Academy. These papers, however, have related entirely to the *phanerogamic* plants, with the exception of that by Dr. D. Moore, on Irish Hepaticæ. Meanwhile, with the rolling on of events, we have to deplore the loss of some who stood in the front rank of the small band of Irish Botanists. Dr. David Moore and Isaac Carroll have been removed by death, and the inexorable fate which so recently overtook our fellow-member, Mr. T. H. Corry, has deprived our Society of one who felt the deepest interest in the objects for which it was established. The wider field of Irish Botany, too, is affected by the premature loss of one who was doing much to enlarge our knowledge of the native flowering plants, and who hoped to take part in the investigation of our *Cryptogamic* flora also.

But while the wheels of fate roll on, bearing away, as we have seen, some of our "best and bravest," they are bringing up to our ranks valuable accessions, and new life. Ever since systematic botany assumed the rank of a science, it has not lacked votaries in Ireland, gifted with acuteness of obser-

vation and enthusiastic love for the study. In the annals of Irish Botany, we find Wade, Templeton, Turner, and others ably leading the van at the close of last century. These were succeeded by such well-known naturalists as Mackay, Taylor, and Hutchins, and these, again, by others who have survived to our own times. So much for the past: indications are not wanting that, in the coming time, there will be those who will carry our knowledge to a still higher point.

As stated in the preface to the list of 1875, the district to which it referred embraced the counties of Down and Antrim, with a small part of Derry. It is a matter of regret that, even yet, it is not possible to include the whole of Derry. The fact is, that as far as bryology is concerned, the greater portion of that county is up to the present a *terra incognita*. The Mourne Mountains, and the southern portion of County Down, have yielded some novelties to the as yet incomplete, examination of the Rev. H. W. Lett, of Ardmore, and Rev. C. Herbert Waddell, of Warrenpoint. These gentlemen have kindly furnished the names of the most interesting species collected by them. A number of their plants remain, which have not yet been diagnosed, but it will be seen, on reference to the list which follows, that they have added materially to our Moss-flora, in a very brief period. It is to be hoped that the quickness of observation, and scientific method Mr. Lett and Mr. Waddell have already manifested will be employed to still further elucidate the natural history of a very interesting region. The Museum of the Belfast Natural History and Philosophical Society contains a collection of mosses by Mr. T. Drummond, acquired by the Society in 1831. Some of these plants have been collected in our locality, and a few of them, not previously published, are now put on record.

The number of Mosses included in the list of 1875 amounted to 238, and the 35 now added bring the number up to 273. Such of the plants as seemed at all doubtful have been submitted to G. A. Holt, Esq., of Manchester, who kindly consented to revise them.* Such revision is of the utmost importance; and the fact that a bryologist of such accuracy has seen the specimens adds much to the value of the records. Rev. John Fergusson, of Forfarshire, has also kindly assisted with advice on some critical plants. Several rare plants have been contribued by J. H. Davies, Esq., of Glenmore; one of these being *Orthotrichum Sprucei*, a species not included in any previous list of Irish Mosses.

Objections will, no doubt, be made to the arrangement here followed, and perhaps also to the nomenclature. It has, however, seemed desirable not to depart from the classification of the original list, to which this is supplementary. As respects the nomenclature I am not convinced of the value of small genera, based on trivial characters.

* Rev. Mr Lett's specimens have been confirmed by Mr. West, of Bradford.

LIST OF SPECIES.

The asterisk denotes that the species was not previously recorded for the district.

CRYPHÆA HETEROMALLA. *Dill.*

This species is frequent throughout the district, but never abundant.

HOOKERIA LUCENS. *Dill.*

Tollymore Park, and Rostrevor Mountain, County Down.—Rev. C. H. Waddell.

HYPNUM LOREUM. *Dill.*

Frequent in the Mourne Mountains.—Rev. C. H. Waddell. Rostrevor Wood; Slieve Comedagh; Slieve Croob (Down); fruit abundant; Ballygally Head (Antrim).—S. A. S.

H. BREVIROSTRE. *Ehr.*

Narrowwater Wood, near Newry, fruiting abundantly.—Rev. C. H. Waddell. Fruiting sparingly at upper end of Holywood Glen, in January, 1876.—S. A. S.

H. SCORPIOIDES. *Dill.*

Rathlin Island (Antrim); barren.—S.A.S.

* H. SARMENTOSUM. *Wahl.*

Very rare. Spinkwee River Glen, above Tollymore Park.—Rev. H. W. Lett.

H. EUGYRIUM. *Schp.*

[This moss, so rare in Ireland, was found by Rev. Mr. Waddell on Anglesey Mountain, County Louth. It should be sought for on the Mourne Mountains also.]

H. RESUPINATUM. *Wils.*

Ballyholme; Cregagh Glen (Down); Kilroot; Ballygally Head; Fair head (Antrim). Frequent in fruit. 11-2.—S. A. S.

* H. CUPRESSIFORME. *Dill.* VAR LACUNOSUM. *Wils.*

Warrenpoint, County Down.—Rev. C. H. Waddell.

H. FILICINUM. *Dill.*

Rostrevor Mountain, and near Moira, County Down.—Rev. H. C. Waddell.

* H. SENDTNERI. *Schp.*

Rare. Rathlin Island.—S. A. S.

* H. RIPARIUM. *Linn.*

Wet places—rare. Abundant in several places, by the Lagan Canal, above Moira, County Down.—S. A. S.

H. UNDULATUM. *Dill.*

Tollymore and Slieve Bignian, Mourne Mountains (Down).—Rev. C. H. Waddell. Rathlin Island (Antrim).—S. A. S.

H. MURALE. *Hedw.*

Walls near Belfast.—T. Drummond. In the water table, Falls Road, near Andersonstown ; also, on a stone dyke, in old road, at back of Cave Hill.—S. A. S.

H. TENELLUM. *Dicks.*

Old Walls of Dundrum Castle (Down); Rathlin (Antrim).—S. A. S.

* H. FLAGELLARE. *Dicks.*

Rocky banks of mountain streams. Tollymore, Yellow Water, &c.; frequent.—Rev. C. H. Waddell. Slieve Donard, Slieve Comedagh, and frequent in the Mourne range, but always barren.—S. A. S.

* H. SPECIOSUM. *Brid.*

Rathlin Island.—S. A. S. Rare and barren.

* H. CRASSINERVUM.—*Tayl.*

Very rare. Cave Hill, near Belfast.—T. Drummond. Specimen in Belfast Museum Collections (*Musci Scotica*).

H. MYOSUROIDES. *Linn.*

Widely spread. Warrenpoint and Rostrevor.—Rev. C. H. Waddell. Slieve Donard (Down) ; Ballygally Head, and Glenshesk (Antrim).—S. A. S.

H. ALBICANS. *Dill.*

In fruit on sandy warren—Donaghadee, February, 1876.—S. A. S.

H. LUTESCENS. *Huds.*

Rostrevor Mountain.—Rev. C. H. Waddell. Upper end of Holywood Glen, and railway bank, Newtownards.—S. A. S.

* Heterocladium heteropterum. *Bruch.*

Very rare. Rocks by stream, Slieve Comedagh, and on rocks in the stream at upper end of Glenmachan Glen (Down).—S. A. S. Barren.

* Leskea polycarpa. *Ehr.*

On bases of ash and alder trees—rare. By the Lagan Canal, above first lock, and by the Six-mile River, above Templepatrick.—S. A. S.

Climacium dendroides. *Linn.*

Fruiting freely near Lisburn; October, 1877.—Mr. J. H. Davies.

Pterogonium filiforme. *Hedw.*

Tollymore Park.—T. Drummond.

* Fissidens osmundioides. *Hedw.*

Wet mountain rocks—rare. On Slieve Croob—sparingly. In several places between Tollymore Park and Donard Lodge.—S. A. S. Fruit, April and May.

* F. exilis. *Hedw.*

Ditch banks—very rare. Ditch banks near Belfast.—T. Drummond, 1831. In a lane leading from Ballygomartin Road to Black Mountain.—S. A. S. It occurs sparingly on the ditch bank at upper end of lane. In fruit, March, 1880.

Tetraplodon mnioides. *Hedw.*

Crocknafeola Plantation, Mourne Mountains.—Rev. C. H. Waddell.

Bartramia ithyphylla. *Brid.*

Slieve Donard, and rocks above Bryansford (Down).—S. A. S. Rising to 1600 feet.

B. arcuata. *Dicks.*

One stem in fruit; November, near Rostrevor.—Rev. C. H. Waddell.

Entosthodon fasciculare. *Dicks.*

Warrenpoint (Down).—Rev. C. H. Waddell.

* E. ericetorum. *De Not.*

Damp rocky places by streams in the mountains—rare. Slieve Donard, at 1500 to 1800 feet.—S. A. S.

E. Templetoni. *Hook. and Tayl.*

Mourne Mountains, at Rostrevor.—Rev. C. H. Waddell. Slieve Donard (Down); Rathlin Island (Antrim).—S. A. S.

Funaria hygrometrica, var patula.

Magheralin (Down).—Rev. C. H. Waddell.

Mnium undulatum. *Hedw.*

Fruiting abundantly in the wood at Narrowwater, County Down.—Rev. C. H. Waddell.

M. rostratum. *Schrad.*

Tollymore Park.—Rev. C. H. Waddell. Castlereagh Hill (Down), and Tardree (Antrim).—S. A. S.

* Bryum bimum. *Schreb.*

Rare (?) A specimen from Fair head (Antrim) seems to be this, but lacks inflorescence.—S. A. S.

B. pallens. *Swartz.*

Mourne Mountains.—Rev. C. H. Waddell.

B. pseudotriquetrum. *Hedw.*

Mourne Mountains.—Rev. C. H. Waddell. Rathlin Island.—S. A. S.

B. carneum. *Linn.*

Magheralin (Down).—Rev. C. H. Waddell.

* B. elongatum. *Dicks.*

Very rare. Slate rocks between Slieve Donard and Tollymore (Down). —Rev. H. W. Lett.

[Aulocomnion androgynum. *Schw.*

Very rare. In bogs near Ardmore (Lurgan), on weathered stumps of bog-fir.—Rev. H. W. Lett. The locality where this rare moss has been found, though in County Armagh, is on the border of our district, and may be hoped for in either Down or Antrim.]

[Oligotrichum hercynicum. *Ehr.*

Very rare. Not found in our district, but collected by Rev. C. H. Waddell from rocks by stream, Anglesey Mountain, County Louth. Probably also on Mourne range.]

* Diphyscium foliosum. *Linn.*

Very rare. Slievenamaddy Mountain.—Rev. H. W. Lett. This moss, so rare in Ireland, has been found also on Anglesey Mountain, Louth, just outside our district, by Rev. C. H. Waddell.

Zygodon rupestris. *Schp.*

Crevices of rocks on the shore at Portavo, and also, close by, on the old wall of the Donaghadee road (Down). In some plenty on the south-west wall of the Bridge on the Larne road, at Kilroot; sparingly on rocks in Rathlin Island (Antrim).—S. A. S.

* Z. viridissimus. *Dicks.*

On trunks of trees; widely diffused in the barren state; rare in fruit. Rostrevor (Down); Shaw's Bridge, Cave Hill, Kilroot, Magheramorne (fruit) Co. Antrim.—S. A. S.

* Orthotrichum calvescens. *Wils.*

Very rare. Two tufts of this moss were collected in the district—I believe in Glenshesk, County Antrim—but as the label has been lost, this species cannot be localised with entire certainty.—S. A. S.

O. leiocarpum. *Br. and Schp.*

On trees, Tollymore (Down).—Rev. H. W. Lett. Base of the Sallagh Braes (Antrim).—S. A. S.

* O. Sprucei. *Mont.*

Very rare. On several trees and bushes by the Lagan Canal, immediately above Drum Bridge (County Down). This moss is plentiful in this, its only Irish station, where it was discovered by Mr. J. H. Davies, of Glenmore, in 1878.

* O. rivulare. *Turner.*

* Rare. Sparingly on trees, at Drum Bridge (County Down), with the preceding species. Discovered by Mr. J. H. Davies in 1878. Since found in abundance on rocks in Glenavy River (County Antrim), near the junction with Lough Neagh.—S. A. S.

O. Sturmii. *Hoppe.*

On trees Tollymore Park, Co. Down.—Rev. H. W. Lett. Plentiful on stones, in a boggy heath, on Knocklayd Mountain, Co. Antrim, with mature and abundant fruit at latter end of April, 1882.—S. A. S.

O. CUPULATUM. *Hoffm.*

On stones in Crumlin River, and on the Gobbin Rocks, Co. Antrim.—S. A. S.

RACOMITRIUM CANESCENS. *Hedw.*

Drumcormac, at base of Slieve Gallion, Co. Derry, on the east side.—S. A. S.

* R. OBTUSUM. *Sm.* R. HETEROSTICHUM VAR. GRACILESCENS. *Bry. Eur.*

Amongst Drummond's mosses, in the Belfast Museum, is a specimen marked by himself "Racomitrium microcarpon of foreign authors—not of Bry. Brit." Subsequently it has been marked, by the hand of Dr. Taylor, "*Trichostomum microcarpon var. oblongum*," and initialed "T. T." I am indebted to Rev. John Fergusson for identifying this specimen with the *T. obtusum* of Smith, afterwards *R. obtusum* of Lindberg. Drummond's specimen was collected more than fifty years ago, and the plant does not seem to have been seen on the Mourne range since that time.

* R. PROTENSUM. *A Braun.*

Very rare. Mourne Mountains.—T. Drummond. Wet rocks in several places between Slieve Donard and Tollymore Park, Co. Down, at 1200 to 1500 feet.—S. A. S.

R. ELLIPTICUM. *Turner.*

Mountains above Newcastle, Co. Down; Benbradagh Mountain, above Dungiven, Co. Derry.—S. A. S.

GRIMMIA LEUCOPHÆA. *Grev.*

On schist, Slievnabrock—Mourne Mountains.—Rev. H. W. Lett.

G. TRICHOPHYLLA. *Grev.*

Plentiful on a glacial boulder, between the Giant's Ring and the Lagan, Co. Down.—S. A. S. Barren.

G. SCHULTZII. *Brid.*

Plentiful on basaltic rocks—Ballygally Head, Co. Antrim.—S. A. S.

G. CONFERTA. *Br. and Schp.* VAR INCANA.

Brean Mountain, Glenshesk; Rathlin Island, Antrim.—S. A. S.

ENCALYPTA STREPTOCARPA. *Hedw.*

On walls, Narrowwater and Tollymore (Down).—Rev. C. H. Waddell, In great profusion on walls of Clady Bridge, near Dunadry, Co. Antrim.—S. A. S. Always barren.

* TORTULA HIBERNICA. *Mitt.*

Very rare. To this species Mr. Holt refers a moss from Rathlin Island. It is, however, a poor, drawn out, and barren form.

T. LATIFOLIA. *Br. and Schp.*

At the bases of trees by the Lagan at Shaw's Bridge, Drum Bridge, and also on trees by the Six-mile River, above Templepatrick, Down and Antrim. —S. A. S. Barren.

* T. PAPILLOSA. *Wils.*

On trees, widely spread, but unfruitful, near Lisburn.—J. H. Davies. Greyabbey and Knock, Co. Down; Ballygomartin, and between Dunadry and Crumlin, County Antrim.—S. A. S. Barren.

T. LÆVIPILA. *Brid.*

Common in Down, Antrim, and Derry; occurring on trees, walls, and rocks.

* T. FALLAX, *Hedw.*, VAR. BREVIFOLIA.

Rare (?) Wet rocks by stream in Cregagh Glen, near Belfast.

T. RIGIDULA. *Dicks.*

Limestone rocks and moist banks near Belfast. — T. Drummond. Chalk rocks—Ballysillan, near Belfast; Rathlin (Antrim), Slieve Gallion (Derry).—S. A. S.

T. INSULANA. *Det Not.*

Divis Mountain.—Rev. C. H. Waddell.

* T. ATROVIRENS. *Sm.*

Very rare. A very small tuft was found on rocks by the shore, Rathlin Island.—S. A. S.

T. ALOIDES. *Koch.*

Walls, Narrowwater, County Down.—Rev. C. H. Waddell.

T. STELLATA. *Schreb.*

On clay, in crevices of slate rocks, Cregagh Glen, near Belfast.—S. A. S. A few capsules only, 12/2/77, and again in January, 1880.

TRICHOSTOMUM HOMOMALLUM. *Hedw.*

On micaceous rocks on Brean Mountain, above Glenshesk, Co. Antrim.—S. A. S.

* T. FLEXICAULE. *Schwg.* VAR DENSUM. *Schp.*

Very rare. On peat, Divis Mountain, near Belfast.—Rev. C. H. Waddell.

* T. LITTORALE. *Mitt.*

Very rare (?) On rocks by the shore, Rathlin Island, Co. Antrim.—S. A. S.

* T. CRISPULUM. *Bruch.* VAR ELATUM. *Schp.*

Very rare. Sparingly on rocks in Rathlin Island.—S. A. S. (Var. not found elsewhere in Ireland).

T. MUTABILE. *Bruch.*

Abundant on chalk rocks at Whitepark Bay, Ballintoy; sparingly on Fairhead, Antrim.—S. A. S. No fruit.

POTTIA HEIMII. *Br. and Schp.*

Rocks by the shore, south of Newcastle (Down); Rathlin (Antrim).—S. A. S.

* P. ASPERULA. *Mitt.*

Very rare. In an old sandpit by the Groomsport Road, close to the Warren, Donaghadee (Down); ledges of basaltic rocks at Blackhead (Antrim); sparingly in both places. Fruit in January and February.—S. A. S. Referred to the above species with some hesitation. The three *Pottias* of Mitten are perilously near to each other.

* CAMPYLOPUS SCHWARZII. *Schp.*

Very rare. Tievedocharrah, between Rostrevor and Hilltown, Mourne Mountains.—Rev. H. W. Lett.

C. FLEXUOSUS. *Brid.*

Benerom, Mourne Mountains.—Rev. H. W. Lett. Mountains above Bloody Bridge, Down, and on Knocklayd, Antrim.—S. A. S. In fine fruit June, July, and August.

* C. ATROVIRENS. *De Not.*

Splashy, wet places on rocky moors; rather rare. Rocky Mountain, Mourne range.—Rev. W. H. Lett. Slieve Donard, Down, and Knocklayd, Antrim.—S. A. S. Barren.

DICRANUM BONJEANII. *De Not.*

Rathlin Island. Sparingly.—S. A. S.

* D. SCOTTIANUM. *Turner.*

Mourne Mountains.—T. Drummond.

* D. RUFESCENS. *Turner.*

Rare. Crown Mountain, near Newry, Co. Down.—Rev. C. H. Waddell. Sandbanks near Belfast.—T. Drummond. Mountain above Glenshesk, Co. Antrim, on mica-schist.—S. A. S.

D. CERVICULATUM. *Hedw.*

Rathlin Island, Glenshesk, and frequent in turf bogs.—S. A. S.

D. SQUARROSUM. *Schrad.*

Rostrevor, Co. Down.—Rev. C. H. Waddell.

D. CRISPUM. *Hedw.*

Sandstone Rock, Derriaghy.—J. H. Davies. Plentiful on sandy bank between the Botanic Gardens and the Stranmillis Road, Belfast; also, on crumbling mica-schist above Glenshesk, Antrim.—S. A. S.

D. PELLUCIDUM. *Linn.*

Slieve Donard (Down), Slieve Gallion, and Carndaisy Glen, near Moneymore (Derry).—S. A. S.

BLINDIA ACUTA. *Br. and Schp.*

Wet places on mountains and by rocky streams; abundant where it occurs. Mourne Mountains.—Rev. C. H. Waddell. Abundant on mountains above Newcastle, Down, and on Knocklayd, Antrim.—S. A. S.

* ANODUS DONIANUS. *Sm.*

Very rare. On Greensand rocks, by the stream, at the top of a little fall in Upper Collin Glen, near Belfast. In good fruit on 19th June, 1876.—S. A. S. Not found elsewhere in Ireland.

* RHABDOWEISSIA DENTICULATA. *Brid.*

Crevices of rocks, very rare. Rocks on ascent of Slieve Donard by the Glen River, and between Donard and Tollymore (Down), also sparingly on summit of Slemish (Antrim).—S. A. S.

R. FUGAX. *Hedw.*

Slievenabrock, between Tollymore and Donard, Co. Down.—Rev. H. W. Lett.

WEISSIA VERTICILLATA. *Brid.*

Limestone rocks, Rathlin Island.—S. A. S.

W. CRISPULA. *Hedw.*

Rocks and boulders, between Rostrevor and Hilltown, Co. Down.—Rev. H. W. Lett.

W. CIRRHATA. *Hedw.*

Mourne Mountains, near Hilltown.—Rev. H. W. Lett. West side of Bencrom, Mourne Mountains.—Rev. C. H. Waddell. Some fine tufts on boulders, on the mountain above Rostrevor Church—October, 1876.—S. A. S.

PHASCUM CUSPIDATUM. *Schreb.*

Rathlin Island.—S. A. S.

SPHAGNUM PAPILLOSUM. *Lindb.*

Wet rocks, not common (?) On rocks on the mountains, above Bloody Bridge (Down), and sparingly on Rathlin (Antrim).—S. A. S.

S. SUBSECUNDUM, *Nees*; VAR CONTORTUM, *Schultz.*

Wet rocks; rare. Plentiful on granite rocks in the mountains, above Newcastle, Co. Down.—S. A. S.

ANDRÆA PETROPHILA. *Ehr.*

Slieve Donard (Down), and on basalt, Cave Hill (Antrim), at 700 feet.—S. A. S.

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APPENDIX VIII.

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I. NOTES ON IRISH COLEOPTERA,

BY A. L. HALIDAY, F.L.S.

EDITED BY S. A. STEWART, F.B.S., Edin.

II. THE CROMLECHS OF ANTRIM AND DOWN,

BY WILLIAM GRAY, M.R.I.A.

III. NOTES ON THE PRE-HISTORIC MONUMENTS,

AT CARROWMORE, NEAR SLIGO:
THE BATTLE-FIELD OF THE NORTHERN MOYTURA.

BY MR. CHARLES ELCOCK.

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NOTES ON IRISH COLEOPTERA,

By A. L. HALIDAY, F.L.S.

Edited by S. A. STEWART, *Fellow of Botanical Society of Edinburgh.*

THE following list has been prepared from manuscript notes made by the late A. L. Haliday, F.L.S. The MS. has been in the possession of the Editor for many years, and as a record of work done by one, who, in his day, ranked amongst the foremost of British entomologists, it has seemed a duty to give it to the public.

Mr. Haliday was one of an illustrious band of naturalists whose love for scientific research, and success in the pursuit, conferred distinction on the town of Belfast during the earlier portion of the present century. It is matter for regret that, with respect to the labours of these local pioneers of science, so little has been put upon record, and that their personal history is, in some cases, imperfectly known to their successors. We do know, however, that they were single-minded lovers of Nature, anxious only for a better knowledge of her ways, and careless as to whether their names should, in all cases, be associated with the discoveries they made.

Many of the species in the following enumeration have been noted, as Irish, in Curtis's Illustrations of British Entomology, but the greater part would seem to have remained unpublished.

The nomenclature is that of the MS., without alteration, but in such cases as where an insect appears under a different name in Stephens' British Entomology, the Editor has appended the latter as a synonym.

Mr. Haliday had three distinct marks, which, placed against the names of the species in a classified list, constituted his method of recording the localities of his captures. The first mark signified "near Belfast"; the second, "elsewhere in Ireland"; the third, "English." No further details are given. As we are not concerned with the English distribution, the two first only are reproduced here. These notes extend to *Hymenoptera*, and other groups, but being, as regards these, incomplete, and lacking localities are consequently omitted.

SCARITIDÆ.	N.B.	E.I
N.B. *signifies Near Belfast;* E.I., *Elsewhere in Ireland.*		
Clivina fossor	*	
Dyschirius politus	*	
.. gibbus[1]		*
.. minimus Curt.	*	
Cychrus rostratus	*	
Carabus catenulatus	*	
.. nemoralis Ill.	*	
.. arvensis	*	
.. cancellatus	*	
.. glabratus	*	
.. nitens	*	
Pogonophorus (Leistus Frœh.) fulvi barbis	*	
.. brunneus[2]	*	
.. spini labris	*	
Helobia brevicollis	*	
.. nivalis Deg.	*	
Pelophila borealis[3]	*	
Blethisa multipunctata	*	
Elaphras cupreus	*	
.. riparius	*?	
Notiophilus aquaticus	*	
.. quadripunctatus	*	
.. biguttatus	*	
Bembidion paludosum	*	
Tachypus striatus	*	
.. andreæ	*	
.. bipunctatus	*	
Thous celer	*	
.. pygmæus		*
Lopha doris	*	
.. pusillus ?	*	
.. assimilis	*	
Peryphus littoralis	*	
.. femoratus	*	
.. viridi-æneus	*	
.. fuscipes	*	
.. atrocæruleus		*
Notaphus bifasciatus		*
Tachys obtusus	*	
.. immunis	*	
.. pusillus	*	
Lega ænea[4]	*	
.. fuscifres	*	
Ocys currens	*	

1 The statement in Curt. Brit. Ent. that D. *gibbus* was found by Mr. Haliday, nea Belfast, does not accord with Haliday's MS., which is as above. Ed.

2 Curtis gives *brunneus* as a synonym for *spini labris*, perhaps *rufescens* was meant b Haliday.

3 P. *borealis* Payk. was figured by Curt's from a specimen in Mr. Haliday's Cabinet, take on the sandy shore of Lough Neagh by Mr. Robert Templeton, on 14th June, 1829.

4 Philocthus, Stephens' Brit. Ent.

SCARITIDÆ.—*Continued.*	N.B.	E.I.
Blemus paludosus	*	
Trechus suturalis	*	
.. fulvus	*	
.. ruficollis	*	
.. minutus, F. aquaticus Marsh.	*	
Ophonus puncticollis	*	
.. pubescens	*	
Harpalus ruficornis	*	
.. rubripes	*	
.. rufimanus	*	
.. æneus	*	
.. dentatus	*	
Badister lacertosus	*	
.. humeralis	*	
Loricera pilicornis	*	
Anchomenus albipes	*	
.. prasinus	*	
.. oblongus	*	
Agonum picipes	*	
.. pullum ?	*	
.. Simpsoni	*	
.. mæstum ?	*	
.. viduum	*	
.. parumpunctatum	*	
.. rotundatum	*	
Synuchus nivalis	*	
Calathus piceus	*	
.. frigidus[1]	*	
.. melanocephalus	*	
.. nubigena. M.	*	
Amara acuminata	*	
.. vulgaris	*	
.. eurynota	*	
.. communis	*	
.. familiaris	*	
.. crassa	*	
.. tibialis, *mihi*	*	
Bradytus apricarius	*	
Cyrtonotus piceus	*	
Chlænius nigricornis	*	
Pristonychus subcyaneus	*	
Stomis pumicatus	*	
Patrobus rufipes	*	
Steropus madidus	*	
Pœcilus versicolor	*	
.. rutilans	*	
.. cupreus	*	
.. rufifemoratus	*	
Omaseus melanarius	*	

[1] *Cistelloides*, Ill., *fuscipes* Gmel., *flavipes*, and *obscurus* Marsh. Ed.

SCARITIDÆ.—*Continued.*	N.B.	E.I.
.. nigrita	*	
.. rufifemoratus	*	
.. tetricus[1]	*	
.. Bulweri	*	
Argutor vernalis	*	
.. erythropus	*	
.. anthracinus[2]	*	
Platysme nigra	*	
Abax striola	*	
Dromia melanocephala	*	
.. meriodionalis	*	
.. 4maculata	*	
.. linearis	*	
.. punctatula		*
Lamprias chlorocephas		*
GYRINIDÆ.		
Gyrina æneus	*	
.. natator	*	
.. minutus	*	
DYTICIDÆ.		
Dyticus marginalis	*	
.. punctulatus	*	
Acilius sulcatus	*	
Colymbetes fuliginosus	*	
.. agilis	*	
.. bipunctatus	*	
.. obscurus	*	
.. Sturmii	*	
.. paludosus	*	
.. bipustulatus	*	
.. chalonotus	*	
.. striatus	*	
Laccophilus minutus	*	
Noterus sparsus	*	
.. crassicornis	*	
Hygrotus confluens	*	
.. reticulatus	*	
.. inequalis	*	
Hydroporus scitulus[3]	*	
.. minimus	*	
.. pictus	*	
.. lineatus	*	

1 This beetle was first discovered and named by Mr. Haliday: it was described by him from specimens taken near Belfast.

2 *Omaseus minor* Dej., Curtis Brit. Ent.

3 H. *scitulus*, H. *pictus*, and H. *fluviatilis* are placed by both Curtis and Stephens under *Hygrotus*.

DYTICIDÆ.—*Continued.*	N.B.	E.I.
.. erythrocephalus	*	
.. triguttatus	*	
.. planus	*	
.. nigrita	*	
.. melanocephalus	*	
.. geminus	*	
.. rufifrons	*	
.. fluviatilis	*	
Haliplous ferrugineus	*	
.. impressus	*	
.. ruficollis	*	
.. affinis	*	
PARNIDÆ.		
Parnns sericeus	*	
.. auriculatus	*	
HELOPHORIDÆ.		
Octhebius hibernicus[1]	*	
.. impressus	*	
.. maritimus	*	
Helophorus aquaticus	*	
.. granularis	*	
.. griseus	*	
.. nubilus	*	
.. dorsalis	*	
HYDROPHILIDÆ.		
Limnebius mollis	*	
.. truncatellus	*	
.. ater	*	
.. picinus	*	
Hydrobius fuscipes	*	
.. orbicularis	*	
.. ochropterus	*	
.. melanocephalus	*	
.. lividus[2]	*	
.. bipustulatus	*	
.. minutus	*	
.. globulus	*	
.. picipes	*	

[1] The specimen figured for this species in Curt. Brit. Ent. was taken by Mr. Haliday on rushes on the shore of Belfast Bay.

[2] H. *griseus* Herb.?, Marsh?, Oliv., Curt. Brit. Ent.

	N.B.	E.I.
SPHÆRIDIADÆ.		
Spheridion scarabæoides	*	
... marginatum	*	
... bipustulatum	*	
... lunatum	*	
Cercyon littorale	*	
... atomarium	*	
... hemorrhoidale	*	
... melanocephalum	*	
... pygmæum	*	
... terminatum	*	
... centrimaculatum	*	
... quisquilium	*	
ANISOTOMIDÆ.		
Anisotoma ferrugineum[1]	*	
... cinnamomeum	*	
... dentipes	*	
Clambus armadillus		
SCAPHIDIADÆ.		
Cypha	*	
Sericorderus thoracicus		*
Clypeaster cassidiodes		*
Catops rufescens	*	
... sericeus	*	
... agilis[2]	*	
... fornicatus	*	
Melegethes rufipes	*	
... ænea	*	
Nitidula varia	*	
... colon	*	
... sordida	*	
... discoidea	*	
... bipustulata	*	
... obsoleta	*	
... silacea	*	
Catheretes caricis	*	
... rufilabrum	*	
... urticæ	*	
SILPHIDÆ.		
Phosphuga subrotundata	*	
Silpha opaca	*	
Oiceoptoma rugosa	*	
... sinuata	*	
Necrophorus humater	*	
... vespillo	*	
... vestigater	*	
Throscus dermestoides	*	

1 This, and the following species were placed by Curtis, and also by Stephens under *Leiodes.*

2 *Cholera agilis*, Stephens' Brit. Ent.

ENGIDÆ, Etc.	N.B.	E.I.
Ips quadripustulatus[1]	*	
Antherophagus silaceus	*	
Mycetia fumata	*	
Biturus tomentosus	*	
Cryptophagus lycoperdi	*	
... fumatus	*	
... ulicis	*	
... cellaris	*	
Atomaria ater	*	
... fuscipes	*	
... pheogaster	*	
... caricis	*	
... globulus	*	
... hirta[2]	*	
... trichopteryx	*	
Corticaria ferruginea	*	
Latridius rugicollis	*	
... impressus	*	
... transversus	*	
... ruficollis	*	
Micropeplis porcata	*	
... tesserula[3]	*	
... staphylinoides	*	
Byrrhus varius	*	
... pilula		*
Semplocaria semistriata	*	
Hister carbonarius	*	
... cadaverinus	*	
... unicolor	*	
... purpurascens	*	
... 12 striatus	*	
... æneus	*	
... nitidulus	*	
Monotoma juglandis[4]	*	
Onthophilus striatus	*	
Abreus globusus	*	
Staphylinus pnbescens	*	
.. nebulosus	*	
.. minimus	*	
.. castanopterus	*	
.. brunnipes	*	
.. erythropterus	*	
.. æneocephalus	*	

[1] The mark placed by Mr. Haliday opposite this name has been blotted, and there is some doubt as to what was intended.

[2] *Atomaria hirta*, Curt. Brit. Ent.

[3] Discovered and named by Mr. Haliday. The specimen figured by Curtis was taken out of a pond in the County of Down, near Belfast, in Feb., 1827.

[4] *Synchyta Juglandis*, Stephens' Brit. Ent.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
Philonthus splendens	*	
.. laminatus	*	
.. aeneus	*	
.. decorus	*	
.. politus	*	
.. marginatus	*	
.. aterrimus	*	
.. bipustulatus	*	
.. sanguineolatus	*	
.. opacus	*	
.. punctus	*	
.. varius	*	
.. fimetarius	*	
Cafias xantholoma	*	
Bionius cephalotes ?	*	
Gabrius nanus	*	
Creophilus maxillosus	*	
Othius ? fulminans	*	
Gyrohypnus cruentatus	*	
.. longiceps	*	
.. linearis	*	
.. punctulatus	*	
.. ochraceus	*	
Lathrobium fulvipenne	*	
.. elongatum	*	
.. brunnipes	*	
.. quadratum	*	
Sunius melanocephalus	*	
Stenus bipunctatus	*	
.. oculatus	*	
.. flavicornis[1]	*	
.. pubescens	*	
.. boops	*	
.. fuscipes	*	
.. circularis	*	
Tachyporus pusillus	*	
.. pubescens	*	
.. hypnorum	*	
.. abdominalis	*	
.. bipustulatus	*	
.. marginellus	*	
Tachinus silphoides	*	
.. subterraneus	*	
.. pullus	*	
.. rufipes	*	
.. marginellus	*	
Hesperophilus hæmopterus	*	
.. cœlatus	*	
Oxytelus rugosus	*	

1 Query *fulvicornis.*

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
.. carinatus	*	
.. piceus	*	
.. laqueatus	*	
.. depressus	*	
.. sculpturatus	*	
.. morsitans[1]	*	
Elonium rugosum	*	
Bolitobius lunulatus	*	
.. atricapillus	*	
.. cernuus	*	
.. analis	*	
.. merdarius	*	
Callicera vernalis[2]	*	
Megarthrus depressus	*	
.. flavus	*	
Aleochara fuscipes	*	
Proteinius brachypterus	*	
Antholobium melanocephalum	*	
.. tectum	*	
.. grossum[3]	*	
Omalium deplanatum	*	
.. rivulare	*	
Lesteva caraboides	*	
.. punctulata	*	
.. obscura	*	
Drusilla canaliculata[4]	*	
Pselaphus Herbsteri	*	
Falagria sulcata	*	
Tychus niger	*	
Autalia rivularis	*	
.. impressa	*	
Bryaxis juncorum	*	
.. sanguinea	*	
Encephalus complicans	*	
Anthicus floralis	*	
Anaspis lateralis	*	
.. ruficollis	*	
.. obscura[5]	*	
Salpingus planirostris	*	
Meloe violacea	*	

1 *Platystephus morsitans*, Step. Brit. Ent.

2 *Callicerus Spencii.* "Taken at Holywood in the shelter of furze bushes; in the first burst of spring I have found it abundant on the fresh grass of sunny banks."

A. L. Haliday, Curt. Brit. Ent.

"C. *hybridus* Hal. MS A single specimen taken at Holywood with the preceding species by Mr. Haliday," Curt. Brit. Ent.

3 A. *piceum*, Step. Brit. Ent.

4 *Astilbus canaliculatus*, Step. Brit. Ent.

5 A. *melanopa*, Step. Brit. Ent.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
Trogosita mauritanica	*	
Atopa cervina	*	
Cryphon melanurus	*	
.. marginatus	*	
.. griseus	*	
Malthinus flaveola	*	
.. biguttatus	*	
.. brevicollis	*	
.. minimus	*	
Thelephorus fulvicollis	*	
.. testaceus	*	
.. pallidus	*	
.. bicolor	*	
.. melanurus	*	
.. æthiops	*	
Elater nigroæneus	*	
... testaceus[1]	*	
.. niger	*	
.. riparius[2]	*	
.. 4 pustulatus		*
Ctenioceras cupreus	*	
Hemirhipus marginatus[3]	*	
.. limbatus	*	
.. segetis	*	
... obscurus	*	
Corynetes quadra	*	
Anobium rufipes[4]	*	
.. striatum	*	
Ptinus fur	*	
.. crenatus	*	
.. testaceus	*	
Cis boleti	*	
.. nitidus	*	
Hylurgus ater	*	
.. ulicis	*	
.. piniperda	*	
Rhizobius litura	*	
Cacidula pectoralis	*	
Coccinella 7 punctata[5]	*	
.. 14 guttata	*	
.. variabilis	*	
.. conglobata	*	
.. 11 notata	*	
.. 13 punctata	*	
.. 22 punctata	*	

1 *Aplotarsus testaceus*, Step. Brit. Ent.

2 This, and the succeeding species stand under *Hypnoidus* in Stephens' Brit. Ent.

3 *Cataphagus*, Stephens' Brit. Ent.

4 Death-watch.

5 Lady-bug.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
.. 18 guttata	*	
.. 11 punctata	*	
.. 14 punctata	*	
Scymnus discoideus	*	
Cassida viridis	*	
.. rubiginosa	*	
Helodes phellandrii	*	
Timarcha coriaria	*	
Chrysomela margenella[1]	*	
.. cochleariæ	*	
.. betulæ	*	
.. vitellina	*	
.. polygoni	*	
.. raphani	*	
.. polita	*	
.. staphylœa	*	
.. Banksii	*	
Galeruca tanaceti	*	
.. capreæ	*	
Haltica testacea[2]	*	
.. tabida	*	
.. lutescens	*	
.. parvula	*	
.. lurida	*	
... cærulea	*	
.. nemorum[3]	*	
.. 4 pustulata	*	
.. erucæ	*	
.. oleracea	*	
.. atricilla	*	
.. fuscipes	*	
.. lepidii	*	
.. orbiculata	*	
.. dentipes	*	
.. helxinus	*	
.. aurata	*	
.. rufipes	*	
.. transversa	*	
.. exoleta	*	
.. nigricollis	*	
.. sordida	*	
.. hyosciami	*	
.. affinis	*	
Lema puncticollis[4]	*	
... cyanella	*	
Leptura lævis	*	

1 Includes *Phædon* of Stephens' Brit Ent.
2 Under *Haltica* we have here insects of the genera *Haltica*, *Thyamis*, *Macronema*, and *Sphæroderma* of Stephens' Brit. Entomology.
3 This minute beetle is the destructive "Turnip Fly."
4 Crioceras, Step. Brit. Ent.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
.. femorata	*	
.. elongata	*	
Cerambyx moschatus[1]	*	
Pogonocerus nebulosus	*	*
.. hispidus		*
Bruchus granarius		*
Apion nigritarse	*	
.. pallipes	*	
.. flavifemoratum[2]	*	
.. viciæ	*	
.. hydrolapathi	*	
.. hæmatodes	*	
.. gibbirostre[3]	*	
.. ervi	*	
.. craccæ	*	
.. æneus	*	
.. vorax	*	
Rhynchites alliariæ		*
.. nanus		*
Ramphus? pulicarius	*	
Tachyerges salicis[4]	*	
Orchestes fagi	*	
.. ferrugineus	*	
.. scutellaris	*	
Tychius cinerascens	*	
Hypera nigrirostris	*	
.. polygoni	*	
.. plantaginis	*	
.. rumicis	*	
.. punctata	*	
.. miles	*	
.. pollux	*	
Notaris acridulus	*	
Leisoma punctata	*	
Hylobius abietis	*	
Barynotus mercurialis	*	
Alophus van	*	
Bagous Lathburii	*	
Mecinus semicylindricus	*	
Dorytomus tortrix	*	
.. pectoralis	*	
.. maculatus[5]	*	
Anthonomus pomarium	*	
.. fasciatus	*	
.. ulmi	*	
Balaninus salicivorus	*	
Cionus scrophulariæ	*	
Orobitis globosus	*	
Sphærula lythri	*	

1 *Aromia moschata*, Curt. Brit. Ent. 2 A. *apricans*, Step. Brit. Ent. 3 A. *carduorum*, Curt., and also Step. Brit. Ent, 4 *Orchestes salicis*, Curt. Brit. Ent. 5 D. fumosus, Step. Brit. Ent.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
Gryphidius equiseti	*	
Rhinonchus pericarpius	*	
.. castor	*	
.. 4 tuberculatus	*	
Nedyus boraginis	*	
.. pollinarius	*	
.. erysimi	*	
.. contractus	*	
.. assimilis	*	
.. troglodytes	*	
Ceuthorrhynchus sulcicollis	*	
.. didymus	*	
Pachyrhinus leucogaster	*	
Phyllobius argentatus	*	
.. parvulus	*	
Polydrusus micans	*	
.. flavipes	*	
.. oblongus[1]	*	
Sitona hispidula	*	
.. cannia	*	
.. lineata	*	
.. lineela	*	
.. tibialis	*	
Strophosomus coryli	*	
Liophlæus nubilus	*	
Cossonus Tardii	*	
Calandra granaria[2]	*	
Serica brunnea	*	
Anomala horticola[3]	*	
Melolontha vulgaris[4]	*	
Typhæus vulgaris		*
Geotrupes vernalis		*
.. sylvaticus	*	
.. stercorarius	*	
Aphodius fossor	*	
.. fimetarius	*	
.. terrestris	*	
.. subterraneus	*	
.. granarius	*	
.. prodromus	*	
.. sphacelatus	*	
.. contaminatus	*	
.. nigripes	*	
.. rufescens	*	
.. merdarius	*	
.. granum	*	
.. turpis	*	

1 *Nemoicus oblongus*, Step. Brit. Ent. 2 Corn Weevil. 3 *Anisoplia horticola*, Curt Brit. Ent. 4 Cockchafer.

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1883-1884.)

THE CROMLECHS OF ANTRIM AND DOWN.

By WILLIAM GRAY, M.R.I.A.,

Ulster Provincial Secretary Royal Historical and Archæological Association of Ireland.

THE gradual decay, and, in too many instances, the complete destruction of our ancient monuments, must be deplored by every Irishman who truly loves his country.

The plough, the spade, and the chisel have been employed in removing many of our pre-historic remains, because in this utilitarian age they have been considered impediments to modern improvements.

Some have been destroyed by the injudicious zeal of professed archæologists, and some by the thoughtless frolic of holiday excursionists.

The destruction that has already taken place and continues unchecked, suggests the desirability, if not the absolute necessity, for some protective measures such as may be secured by Parliamentary enactment.

With this view a Bill has been frequently introduced into the House of Commons by Sir John Lubbock and others; their laudable efforts have not as yet resulted in legislation on the subject. Let us hope that the enlightened spirit of the age will

swell the number of Sir John Lubbock's supporters, and that the time is not far distant when we shall have our ancient monuments under the protection of the Crown, and secure from the decay to which they are now exposed.

Anticipating such an event, it is most desirable that we should have some complete catalogue or schedule of the ancient monuments of all kinds at present existing in Ireland.

Already certain lists have been prepared—in England, by a Committee of Archæologists, selected by the Society of Antiquarians; in Scotland, by the Society of Antiquarians of Scotland; and in Ireland, by the Royal Irish Academy.

Notwithstanding the efficiency of these organisations, and the ability of the several archæologists employed, the schedules prepared were very far from complete, especially for Ireland, mainly because there was no systematic effort hitherto made to catalogue the monuments existing in this country.

The appeal for contributions to this end, made in the 4th vol. of the *Ulster Journal of Archæology*, met with no response.

Doubtless, descriptions of all the more important structures may be found scattered throughout works of history and archæology, or in the transactions of learned societies; but an attempt to tabulate the records thus available would not be so useful as a catalogue compiled from recent personal observation, whereby the *present number and condition* of our ancient monuments could be accurately set forth.

The following contribution has been prepared under a conviction that, with our available organisations and the number of public officials now engaged throughout the country, a complete catalogue of all our Irish ancient monuments could be readily compiled, and the author hopes he may be able to render some assistance in this direction, particularly for the North of Ireland.

In an undertaking of this kind it is necessary that the several monuments should be grouped under separate headings, according to their most distinctive characters. This systematic classification of the monuments would facilitate the distribution of the work to be done, and secure a more satisfactory result.

IRISH CROMLECHS.

In the absence of any fixed code of terms, the author, like many other writers on the subject, has to make his own selection, and having undertaken to catalogue "The Cromlechs of Antrim and Down," it will be necessary, in the first instance, to settle what is to be understood by the term "Cromlech." This is all the more necessary because of the conflict of opinion entertained by archæologists with reference to the proper application of the term.

The opinion that prevails most commonly among the country people is, that the monuments were built by the Druids as altars. An exposition of this erroneous idea is given in the *Dublin Penny Journal*, 31st May, 1834, page 381, where the writer says:—

"This species of rude altar is very common in many parts of Ireland; it is called both in the Irish and old British language 'Crom liagh' and 'Crom-lecht,' which signify in both a crooked stone, not from any crookedness, but from their inclining posture. They are supposed to have been so formed, in order to allow the blood of the victims slain upon them to run off freely."

O'Curry, in his lectures,* refers to these monuments as "vulgarly called Cromlechs," and says "they never were intended, and never were used as altars or places of sacrifice of any kind, that they were not in any sense of the word 'Druidical,' and that they were in every instance simple sepulchres or tombs, each marking the grave of one or several personages."

Professor Nilsson says—"They are called in Scania, *dös*, in Denmark, *dyss*, in England, *cromlech*, and in France, *dolmen*." †

The Rev. H. Rowland, in his work on the Isle of Anglesea,‡ says:—

"These altars of stone (where stone served to raise them up) were huge, broad, flattish stones, mounted up and laid flat upon

* O'Curry's Lectures on Ancient Irish History. Page 597.

† S. Nilsson on the Stone Age. Page 159.

‡ Mona Antiqua Restaurata. Dublin, 1723. Page 47.

other erect ones, and leaning, with a little declivity in some places, on those pitched supporters, which posture, for some now unaccountable reasons, they seem to have affected, and were and are to this day vulgarly called by the name of 'Cromlech,' either from their bending position, which is generally believed, or rather (that bending posture being not always to be found in everyone of those monuments, nor, indeed, applicable to the idea and notion of 'Crom' in our language) that these first men (I shall adventure to guess) carried the name with them from Babel, as they did several other words, and called it 'Caeraem-lech,' from the Hebrew 'Caerem-luach,' a devoted stone or altar."

In Owen Connellan's edition of the Four Masters* we have the following note :—

"The name Cromleac signifies the stone of Crom, and they were so called from being used in the worship of Crom, one of the deities of the Irish Druids, said to represent Fate; or, according to Lanigan and others, the god of fire, or the sun, and sometimes called Crom Dubh, or Black Crom, and Crom Cruach, signifying Crom of the Heap of Stones or Cairns, as quoted by Lanigan from the Tripartite Life of St. Patrick; and the Idol of Crom Cruach, as stated in Lanigan and O'Flaherty's Ogygia, quoting from the Four Masters, and also in the Book of Invasions, by the O'Clerys, was destroyed by St. Patrick in the temple of the Druids, on Magh Sleacht, in Brefney, now Fenagh, in Leitrim; and the last Sunday of summer is still called Domhnach Chrom Duibh, or the Sunday of Black Crom, being sacred to St. Patrick as the anniversary commemorating the destruction of the idol. This is the real origin of the name Cromleac, and not from the stones being in a sloping position, as absurdly stated by some writers, and derived fron the opinions of the common people."

Sir John Lubbock says :—"Cromlech is derived from 'Crom,' a circle, and 'lech,' a stone, and Dolmen from '*daul*,' a table, and '*maen*' a stone;" and, with reference to the terms, adds—"They

* The Four Masters. By Owen Connellan. Page 271.

should, therefore, certainly be used as in the text—that is, that the word 'Cromlech' should include stone *circles*, and 'Dolmen' should be applied to stone *chambers*."*

The terms *Cromlech* and *Dolmen* may be almost etymological equivalents, yet the adoption of the term "*Dolmen*" would not be sufficiently distinctive for our purpose, because the Continental archæologists include several kinds of monuments under that denomination. The term is not of Celtic origin, and it does not harmonise with Irish words. Mr. Edward T. Stevens, in "Flint Chips,"† describes chambered tumuli under the name of Dolmens. It will be observed that the authors just quoted employ both the terms, "Dolmen" and "Cromlech," in a generic rather than in a specific sense, and describe a great variety of monuments under the respective terms. See also "Essai sur les Dolmens," by Baron de Bonstetten, of Geneva. Dr. Lukis, who has done good service in exploring the ancient monuments of the Channel Islands, would include all our cromlechs under the general term "chambered tumuli," being of opinion that all were at one time of their history covered.‡

In the first volume of the "Royal Irish Academy Museum Catalogue," the author, Sir W. Wilde, referring to the chamber found in Phœnix Park, says:—"This discovery went far to establish the belief that cromlechs were but uncovered tumuli, which originally contained sepulchral remains." Llewellyn Jewett adopts the theory of Dr. Lukis, and says that researches "prove beyond doubt that the cromlechs are neither more nor less than sepulchral chambers denuded of their mounds."§ On this point Mr. Ferguson, a well qualified authority, maintains a contrary opinion, and in his work on Rude Stone Monuments, says—"It seems impossible to believe that the bulk of those we now see were ever hidden by an earthen covering."‖

* Pre-historic Times. By Sir John Lubbock. Page 104.

† Flint Chips. A Guide to Pre-historic Archæology. Page 105.

‡ Rev. W. C. Lukis, Norwich. Vol. of Pre-Historic Congress. Capt. Oliver, R.A., "Megalithic Structures of the Channel Islands."

§ Grave Mounds and their Contents. Page 51.

‖ Rude Stone Monuments in all Countries. By James Ferguson, D.C.L., F.R.S. London, 1872. Page 44.

If modern research had demonstrated that all cromlechs were originally only chambers of tumuli, it would still be advisable to use a term expressive of their *present condition.* For this purpose the author considers the term "Cromlech" would be the most appropriate.

The original condition of all cromlechs as chambers in tumuli is now incapable of proof, either in Great Britain or the Continent; it would, therefore, be very unwise to adopt a term that would express and perpetuate what must be only a conjectural idea of the original condition of these monuments.

This is a fatal objection to the position taken by Dr. Lukis, in his controversy on the subject with Mr. Du Noyer, in which the former suggests that the terms "Cromlech" and "Dolmen" should be discarded, and the term "Chambered Tumulus" substituted, employing this term in a generic sense.*

Mr. Du Noyer, in common with Sir Gardiner Wilkinson and Colonel Meadows Taylor,† adopts the term "Cromlech," but limits it very properly to a distinct form of monument, and states his reasons in a most exhaustive and valuable communication, published in the journal of the Kilkenny Archæological Society.‡

But the restrictions imposed by Mr. Du Noyer are embarrassing and confusing, because he would limit the term "Cromlech" to such monumeuts as have been always *subœrial*—a character that is incapable of proof in any case; and he further perplexes the matter by suggesting that the cromlechs were not in themselves places of sepulchre—an opinion quite untenable. See extract from O'Curry's lectures quoted above. Besides, the character of the remains and objects found in the chambers of so many Cromlechs proves they were places of sepulchre.

Objections have been urged against the use of the term "Cromlech," because of its modern introduction, and because

* Journal of Kilkenny Archæological Society. Vol. V., page 495.

† Transactions of the Royal Irish Academy. Vol. XXIV. Part 5. 1865.

‡ Journal of Kilkenny Archæological Society. Vol V. N.S. Page 474.

such a term is not known generally among the Irish-speaking people; but such objections are not feasible, because it is only modern systematic classification that requires special specific terms, and such terms are not commonly employed by the people. The popular terms applied to ancient monuments even of the same class are nearly as varied as the localities in which the monuments occur. It should be noted, however, that in Ireland the prevailing idea involved in local names for cromlechs is that of a *bed* or final *resting place.*

If we refer to the ancient Irish manuscripts, we will find that the sepulchral monuments referred to under the generic term "Leacht," include the group we call "Cromlechs."

Dr. Sullivan, in his introduction to O'Curry's lectures on the manners and customs of the ancient Irish, says:—

"The word *leacht* seems to have been a general term applied to stone sepulchral monuments, consisting either of unfashioned stones of every size piled up over a simple grave, or over an "*Indeilb cloich*" or stone chamber, or of a number of large upright flags, upon which was placed a great block of stone." The latter kind of *leacht* is the monument popularly known as a "Cromlech." A simple flag marking a grave was called a *leac* or *liace* (plural *leaca*). When a number of persons were buried beside each other, their *leaca* were placed in a circle around the grave. Similar circles of *leaca* or upright flags were put around the *leachts*, formed of piles of stones. Pillar stones, or *cairti*, were also used to mark graves, and sometimes the name of the dead person was cut in *Ogam* upon them. The word *leacht* occurs frequently in topographical names, as, for instance, in *Tamleacht*, modernised in one case to *Tallaght*, a place near Dublin, but unchanged in *Tamlacht O'Crilly*, in the County of Londonderry. *Tamleacht* may be translated as the *leacht* of plague, and, so far as I know, consisted of several graves marked by a head and foot stone, or covered over by a *múr clocihe* or stone *múr*, and, where there were a number of them in the same place, surrounded by a circle of "*Leaca.*"*

* Manners and Customs of the Ancient Irish. Vol. I., page 331.

Near Coagh, County Derry, or about five miles east of Cookstown, there is a very fine cromlech, locally known as "The Tamlacht Stone"—*i.e.*, the plague stone. Here we have the ancient Irish name "*leacht*" popularly applied to a genuine cromlech. We may, therefore, reasonably accept the term "Cromlech" as a qualification of the generic Irish term "Leacht"—and expressive of their usual leaning or bending character, due probably in many cases to the fact that their original constructers were not able to obtain suitable supporters and in other cases, where such supports gave way with time. The qualification "crom" is, therefore, indicative of a bending with age, and is very significant.

What we require is a specific term applicable to the particular group of monuments we wish to describe, and expressive of their *present structural condition*, without involving any theory as to their original condition or object, and the term "Cromlech" meets these requirements fully.

The majority of our sepulchral monuments are more or less chambered, but they are separable into groups, each being very distinct in character. Our chambered tumuli are quite distinct from our kistvaens, and both differ so widely from our cromlechs that they could not be grouped under one head.

We have a capital example of the chambered tumulus crowning the hill of Carnanmore, East Torr, in the parish of Culfeightrin, County Antrim. This is the subject of our first illustration, which shows a distinct chamber formed of blocks of stones, roofed by large flags, and all closed or covered over by a great heap of small stones. There is scarcely a feature common to it and a Cromlech. See Sketch No. 1.

Farther south in the same county, on the high ground three and a half miles from Carnlough, on the road to Ballymena, we have the subject of our second illustration—Doonan Fort—an example of a tumulus and kistvaen totally unlike what is understood as a cromlech, and which could not be grouped under that head. See Sketch No. 2.

Certain chambers of kistvaens may occasionally be found that

very closely resemble cromlechs. As, for example, the kistvaen at Roughfort, in the parish of Templepatrick, which occurs about three and a half miles south of Doagh, and seven miles north of Belfast, and consists of a series of chambers forming a group forty feet long, the terminal chamber being very large, and covered by a great block of stone.

There are about thirty-eight stones in the group, and the block over the large chamber measures 6 ft. $\times$ $5\frac{1}{2}$ ft. $\times$ $3\frac{1}{2}$ ft., or equal to about eight tons.

If, in the course of time, this single chamber was left standing alone, it would have all the characters of a cromlech, and might be very fairly described under that head. See Sketch No. 3.

The author would define the term "Cromlech" as an ancient rude stone monument composed of one large block, supported by two or more stones, usually set on end or edge, forming a sub-ærial chamber.

Of such monuments the following include all those that occur in the Counties of Antrim and Down, and each of them has been personally examined by the author, and, as far as possible, measured and sketched.

CROMLECHS IN COUNTY ANTRIM.

The neighbourhood of Ballintoy, on the north coast of County Antrim, possesses many features of very great interest to the Irish archæologist, particularly the picturesque slopes of Whitepark Bay, to the west of the parish church. The long stretch of sand-dunes that skirt the base of the talus, below the mural cliffs of chalk surrounding the bay, formed the camping ground of early settlers. The evidence in proof of those ancient settlements is furnished by the quantities of stone implements, worked flints, chips and cores, charcoal and pottery, that have been collected here from time to time, and which, from their quantity and variety, indicate long periods of continuous occupation.*

* Journal of the Royal Historical and Archæolgoical Society. 4th Ser., Vol. V., July, 1879. Belfast Naturalists' Field Club Guide to Belfast, &c., 1873.

On the slopes of the higher hills, to the south of the public road above the bay, there are no less than three very fair cromlechs, as follows :—

1. MOUNT DRUID CROMLECH.

SKETCH No. 4.

This monument occupies a very commanding site on the hill-side above the rectory, from which the headlands of the Causeway cliffs can be seen. It is known as the "Druids' Altar," and consists of a large block about 6½ ft. long and 5½ ft. wide, supported on three of the four smaller stones forming the chamber.*

This monument comes within Sir John Lubbock's category of cromlechs, because it is enclosed by two circles of stones, one inside the other. The diameter of the outer circle is about 35 feet, and the stones composing it are about two feet high. Where stone circles occur in connexion with tumuli, they are on the outside. So small a circle as we have here is an indication that, at all events, this cromlech is not a mere chamber of an original tumulus, because a tumulus inside the circles could not very well cover the cromlech. The enclosing stone circle is an unusual feature in connexion with the cromlechs of the North-east of Ireland, and it is to be hoped that where they occur they may be preserved from further destruction. Sketch No. 4, and all the sketches illustrating this paper, have been taken on the spot by the author, who recommends that they should be compared with the respective monuments themselves, or with photographs of the monuments, rather than with such illustrations as are given in the statistical surveys for the Dublin Society, or in the "Dublin Penny Journal."

2. GLEGNAGH CROMLECH, BALLINTOY.

SKETCH No. 5.

This small but very perfect cromlech is in the townland of Glegnagh, near a quarry on the hill-side, south of the public

* Statistical Survey, County of Antrim, 1812—Part II., page 582. "Dublin Penny Journal." Vol. III., page 351.

road from Ballintoy to the Causeway, and about as far from the road to the south as Whitepark Bay cliffs are to the north side. The sketch is taken from the west side, looking towards the parish church. The islands off the west coast of Scotland can be seen from this monument. The author has found worked flints, flint flakes, and numerous chips of flint very near the cromlech. Stone celts have also been found in the immediate neighbourhood.

3. CLOGHNABOGHIL CROMLECH, BALLINTOY.

SKETCH No. 6.

This is the smallest cromlech in the North-east of Ireland. Its local name, Cloghnaboghil, signifies *the stone of the boy*. It is situated on the high ground in the townland of Lemnabeg, within half a mile to the west of Glegnagh Cromlech (2), and within sight from the public road. From the open and elevated position of this cromlech there is a very extended prospect seaward, including a considerable portion of the west coast and islands of Scotland.

4. CLOGHANUNCHER CROMLECH, BALLYCASTLE.

SKETCH No. 7.

This cromlech occurs on the heath-covered mountain, in the townland of Ballyvennaght, on the north side of the road from Ballycastle to Cushendun, and near what is known as "The Hungry House," being the house highest on the mountain in that direction. There are three bridges on the county road near "The Hungry House," and the cromlech is about a quarter of a mile from the centre bridge, in the direction of East Tor. The chamber, measuring about 5 ft. $\times$ $3\frac{1}{2}$ ft., is formed of four upright stones, and is covered by a large stone 9 ft. long and 7ft. 6 in. wide, all the materials being of the Cambrian rocks of the district. There is a very good standing stone, gallaun or menhir, on a hillock near this cromlech, and it can be seen from the county road.

5. BALLYVENAGHT CROMLECH, BALLYCASTLE.

SKETCH No. 8.

This cromlech is about eighty yards north of No. 4. The sketch is taken looking south-west, and shows No. 4 Cromlech in the distance. The top stone measures 13 ft. 4 in. by 11 ft. 6 in., and is about three feet thick. The supporting stones have given way, and are crushed under the ponderous cap stone. The site is a swampy moorland, at the head of the valley of the Cary river. This and the last cromlech are almost overgrown with peat.

6. CLOGHS CROMLECH, CUSHENDALL.

SKETCH No. 9.

In the townland of Cloghs, to the west of Cushendall and about one and a half miles from the village, there is a cromlech with a chamber four feet long and three feet four inches wide, formed of six blocks of stone. The cap stone is turned over from its original position, otherwise the monument is in fair condition. There were other stone monuments in the vicinity, but they have been destroyed. A rude stone circle and avenue occurs on the mountain slope one mile west from the road to Cushendun. It is locally known as "Ossian's grave." The site commands an extensive prospect: from it the Scotch and Irish headlands can be seen, and is well worthy of a visit.

7. TICLOY CROMLECH.

SKETCH No. 10.

In the townland of Ticloy—*i.e.*, *The Stone House*—there are two cromlechs in the same field, the most perfect being the subject of our sketch. The second is shown in the background. The name of the townland is derived from this monument, which still retains the appearance of a stone house. It is well situated on Ticloy hill, above Ticloy water, about five miles to the west of Glenarm, and ten miles east by north of Ballymena. The land is cultivated all round the site, but the farming operations are carefully conducted, so as not to damage the monument in any way.

The gossip of the neighbourhood tells of a former occupier of the farm who had a dream, in which he was informed that there was some treasure buried beneath the cromlech. It is said he dug for many days, and at last found a crock, and that afterwards he became very wealthy, but refused to give any particulars as to his supposed treasure. Doubtless he did find a crock in the shape of a cinerary urn, and his disappointment at not finding gold prompted his reticence. The ruined condition of the second cromlech is, no doubt, the result of treasure-hunting, and to some extent corroborates the anecdote just related.

8. BROADSTONE CROMLECH, CRAIGS.

Sketch No. 11.

On a heathy moor, in the townland of Craigs and parish of Finvoy, there is a very remarkable cromlech, known as "The Broadstone." It is about six and a half miles from Ballymoney in a southerly direction, or about one mile above the rectory of Finvoy. In former times this place was resorted to on Sundays and holidays for picnics, coursing, games, and pastime, and, doubtless, the consequent frolic and thoughtless mirth provoked on those occasions was the cause of the dilapidated condition of this monument at present. Happily there are very few who would wantonly or maliciously destroy our ancient monuments, yet the spirit that animated the ancient *Cuitech Fuait*, or funeral games, has expired long ago, and the object of their commemoration has been forgotten; therefore, the young folk of modern times, who entertain no profound veneration for ancient usages, think lightly of the injury their playfulness may occasion to ancient monuments, although they would not wilfully do them harm. The cromlech, as it now stands, is a restoration; the cap-stone, measuring 8 ft. 6 in. by 10 ft., and about 20 in. thick, was thrown down, but was re-erected on its three supporters, as at present, by the people in the neighbourhood. Adjoining the cromlech proper there are the remains of three or four circular chambers, and the group of stones

composing the cromlech and chambers is again surrounded by two concentric stone circles, the outer circle being about one hundred feet in diameter, and the inner fifty feet. Very little now remains to mark the outline of the circle. The sepulchral character of this very important monument is proved by the finding of cinerary urns in the round chambers.

9. FINVOY CROMLECH, CRAIGS.

SKETCH No. 12.

Although Broadstone cromlech has been frequently described, the subject of this sketch has been apparently overlooked; yet it is a very typical example, and occurs in a cultivated field close to the public road, within half-a-mile west of the Broadstone, and one mile east of the Presbyterian Church of Finvoy. The cap-stone is a flat slab, measuring 8 ft. long by 5 ft. 6 in. wide, over eight upright stones, forming a well-marked oval chamber, the major axis of which runs E.N.E. by W.S.W.

Formerly this monument was almost covered with earth, the cap stone alone being exposed. The earth was removed some years ago, and the monument now stands on the natural surface of the ground. During the excavation the chamber was explored, and a cinerary urn was discovered within.

10. CLOUGHOGAN CROMLECH, BALLYGILBERT.

SKETCH No. 13.

On the eastern slope of Ballygilbert hill, above the old road from Larne to Glenarm, there is a cromlech locally known as Cloughogan. It forms part of a boundary hedge near a farm cottage, and has done service for many years as a pigsty and poultry-house. For this purpose the open space between the uprights have been carefully filled in with small stones. The thrifty housewife who made this change, claims the credit of having built the house. Her worthy spouse, however, contends that the Danes built Cloughogan before the memory of man, and that she only built the byre. This cromlech is about eight miles north of Larne, or three and a half miles south of Glenarm,

on the slope of the hill to the west of the old road from Larne to Glenarm. There are many other antiquarian remains in the same locality, and worked flints are found scattered over the surface of the fields.

11. DRUIDS' COTTAGE CROMLECH, ISLANDMAGEE.

SKETCH No. 14.

The subject of this sketch may be found at the road-side, on the hill overlooking Larne Lough, from the northern extremity of Islandmagee, opposite the point of the Curran, and about one mile from the ferry. A cottage has been built adjoining the cromlech, so that the latter stands within a few yards of the front windows—a circumstance that has, doubtless, served to preserve the monument up to the present. The cap-stone, which is about six feet long, covers a chamber formed of blocks of stone standing on end, and together form a very fair example of our Irish cromlechs. The folk-lore of the locality refers to this monument when it had a far more imposing appearance, being in early times surrounded by other stones, possibly a complete circle. The building of the cottage and other *improvements* removed all trace of the circle, and the cromlech now stands alone. Early in the present century a number of gold ornaments were found in the immediate vicinity of the cromlech,* and worked flints may still be found on the surface of the sloping ground towards the lough.

12. FAIR HEAD CROMLECH, BALLYCASTLE.

Away to the east of Ballycastle, above the collieries, on the rocky plateau of Fair Head, there are the remains of a small cromlech. Within living memory this monument was complete, and the chamber was the favourite retreat of badgers. Here the country sportsmen came with their dogs to hunt, and the "sport" resulted in the overturning of the cap stone and the comparative destruction of the monument.

* See Dublin Penny Journal. Vol. I., 1832. Page 209.

13. CLOGHS CROMLECH, CUSHENDALL.

Within about a quarter of a mile from No. 6, and farther down the slope of the hill, there was once a very large cromlech. Many of the stones that composed the chamber may still be traced in the fences near the site; but the great cap stone and others were removed some years ago by an enterprising workman, who had them blown up by gunpowder to supply material for building the adjoining house; "*an by the same token*," says our informant, "*no good iver come if him.*"

14. MOYARGET CROMLECH.

This monument stood near the southern, or rather eastern, bank of the Invir, or Inver, Water, now a small stream separating the parish of Ramoan from the parish of Ballintoy. Like the last, very little of it now remains to indicate its former importance. Twenty-five years ago the standing blocks were known locally as the *grey stones*. There were originally about six supporting stones about five feet long, the cap stone being about eighteen feet long. The Rev. George Hill, a well-known archæologist, was one of a party who explored this cromlech in 1840. "A large urn of burnt clay was found about two feet below the surface, placed with the mouth downwards on a rude pavement, and contained a dark paste, evidently ashes made damp."

This monument may have originally marked the burial-place of a great northern chieftain named *Arghad*, from whom the two townlands of Upper and Lower Moyarget (Magh-Arghad) may have had their names.

15. TICLOY CROMLECH, No. 2.

This cromlech occurs in the same field as No. 7, and has been already sufficiently noticed. In sketch No. 10, the blocks of stone that composed the monument are shown at the foot of the tree in the background.

16. DRUMAGORGON CROMLECH.

Within about three miles from Antrim to the N.E., in the townland of Drumagorgon, there are the remains of a cromlech, locally known as "the giant's grave." The cap stone, about six feet long, has been overturned, and the monument otherwise dismantled, but not beyond the possibility of restoration. Tradition says that the adjoining hill to the east, known as "The Standard," was the scene of a great contest between two rival chiefs, and that one was killed and buried in this cromlech, together with his weapons of war. An enquiring antiquarian, early in this century, wishing to test the accuracy of this story, dug below the cromlech, and discovered such remains as satisfied him that a burial did take place here—a conclusion that was come to at the expense of the cromlech.

CROMLECHS IN COUNTY DOWN.

1. GIANT'S RING CROMLECH, DRUMBO.

SKETCH No. 1. PLATE XVI.

One of the most remarkable of the ancient monuments in the County Down is the well-known Giant's Ring at Drumbo, about three and a half miles to the west of Belfast. It consists of a circular rampart of earth, enclosing a space of about six hundred feet in diameter, or an area of eight acres. The earthwork is in a very fair state of preservation, owing to the judicious care of the owner, who had the rampart surrounded by a masonry wall, and otherwise well protected.

The height of the earthen rampart is sufficient to shut off a view of the surrounding landscape. In section it has a good broad base of about eighty feet, and slopes equally at both sides. The top, at present, is somewhat flat, a form which is apparently due more to weathering than to the original construction.

The cromlech stands almost in the centre of the enclosure; all the stones forming the chamber are *in situ*, but others are more or less disturbed, and seem to indicate that there was

originally an avenue leading to the chamber. In former times "the ring" was used as a race course, for which it was admirably suited, the rampart making a "grand stand." Under the circumstances, it must be a matter of congratulation that we have so much of the monument preserved. Excavations have been made in the vicinity of the enclosure, and several sepulchral remains have been found. A circular chamber was exposed about seven feet in diameter, formed of blocks of stones covered over with flags. Minor internal divisions of the main chambers contained four cinerary urns and other evidence of ancient burials. Within a short distance of this chamber several other cists of sepulchral character were discovered, all indicating the importance of the central monument in ancient times.*

2. KEMPE STONE CROMLECH, DUNDONALD.

SKETCH No. 2.

The megalithic monument, locally known as the Kempe Stone, is one of the most important in County Down. It occurs on the high ground about a mile to the west of the village of Dundonald, and not far from the main county road from Belfast to Newtownards. The group of stones composing the monument occupy a space of 12 ft. by 8 ft., and stand ten feet high to the east and six feet to the west. The chamber measures five feet long, five feet wide at east end, and three feet wide at the west. This chamber is formed of six blocks of stone; the eastern blocks are upright, and the side blocks are on edge, eight, and seven feet long respectively; the cap stone measuring eight feet six inches long, seven feet wide, and on an average three feet six inches thick. The block must weigh about seventeen tons. The top of the cap stone has a quick fall or slope to the west. This feature, so common to our cromlechs, may in this case be due to original construction, as the stones supporting it at the west are smaller than those at the east end, and the cap itself is thinnest at the west end. The present name of the townland is Greengraves. The locality was formerly denominated *Bally-clogh-togle* (town of the raised or lifted

* Ulster Journal of Archæology. Vol. III., page 357.

stone). Local tradition states that a stranger warrior has been buried there. Apart from the monument itself, there are scattered all round the vicinity large blocks of stone. Many of them are now built into, or form parts of the boundary hedge. Their distribution and character indicate that they are the remains of some dismantled megalithic monument of very considerable importance.

3. MOUNT STEWART CROMLECH.

Sketch No. 3.

Within the demesne of Mount Stewart, in the parish of Greyabbey, about five miles from the town of Newtownards, there is a small cromlech-like monument, the remains of a very remarkable cemetery that once existed here. It consisted of a cairn of small stones about thirty feet in diameter and five feet high, and constituted what might be denominated a chambered tumulus.* In 1786 the then owner of the estate considered it desirable to drain the field, and the work was undertaken, calculating upon the advantage of having so large a supply of suitable material for filling up the drains. As the workmen employed removed the stones from the cairn, or tumulus, they exposed on the southern portion of the heap a number of cists or stone chambers (between sixty and seventy), formed of stones on edge, and covered by flags. In the north-west corner of most of the chambers there was deposited a cinerary urn, many of them being quite perfect and elaborately decorated with the usual incised patterns, specimens of which are to be seen in private collections, and in the Belfast Natural History Museum. The central chamber was very much larger than the surrounding cists, and constitutes the subject of our sketch. At the side of the cromlech one of the smaller cists, or sepulchral chambers, is preserved. A full description of the exploration of this monument is given in a pamphlet, entitled "An Historical Essay on the Parish and Congregation of Grey-abbey," by Dr. S. M. Stephenson, published in Belfast in 1828.

* See Ulster Journal of Archæology.

4. LOUGHMONEY CROMLECH.

SKETCH No. 4.

The parish of Saul, so closely identified with the life and labours of St. Patrick, is rich in antiquarian remains, of which the cromlech of Loughmoney is one of the most interesting. It is in a good state of preservation, and stands in a field close to the public road, a few miles east of Downpatrick. The cap stone measures nine feet six inches by five feet three inches, supported by only two stones on edge, each seven feet by three feet, forming a chamber about two feet ten inches wide, and at present open at both ends.

5. LOUGHANISLAND CROMLECH.

SKETCH No. 5.

On the north shore of Loughanisland lake, four miles south of Crossgar and four miles west by north of Downpatrick, near the Buck's Head Tavern, in the townland of Annadorn, there is a cromlech having a well-defined chamber of four large blocks of stone, with a cap stone measuring eight feet by seven feet. The latter has been turned over a little from its normal position. Some years ago a utilitarian wanting building materials set about demolishing this cromlech by a powder blast. A splinter of rock fell on and damaged the roof of his dwelling-house—an incident he took to be an omen of bad luck, and quietly gave up the undertaking.

6. SLIDDERY-FORD CROMLECH.

SKETCH No. 6.

Within a mile of Dundrum, at Sliddery-Ford, on the Newcastle road, in the townland of Wateresk, there is a very perfect cromlech. The cap stone, a granite block, measures seven feet six inches by seven feet six inches, or nineteen feet six inches in girth, covers a chamber formed of three blocks of stone, one being six feet high. In Dubourdieu's statistical survey of County Down, page 271, he describes a circle of twelve standing stones near this cromlech. At present there are but two in the

locality, at the side of a lane, a little to the south of the cromlech, one of the stones being eleven feet high. The field in which the cromlech stands also contains a souterrain or underground dwelling, and the view from the cromlech overlooks the sand-dunes of Dundrum, which have yielded such a number of worked flints, stone implements, pottery, and other evidences of ancient settlements.*

7. CLOUGHMORE CROMLECH, GOWARD.

SKETCH No. 7.

The cromlech known as Cloughmore, on the mountain side, in the parish of Clonduff and townland of Goward, is one of the largest and best in the county. It is accessible from Hill-town or Rathfriland, being two miles from the former and five from the latter. It consists of a massive cap stone of granite, thirteen feet long, ten feet wide, and five feet thick, weighing probably fifty tons, supported by a group of nine other stones forming several chambers, the principal chamber being nine feet long and three feet six inches wide. One of the front uprights is very slender, and stands seven feet high, the complete monument being fully fourteen feet high. Local authorities state that formerly this cromlech was enclosed by a circle of stone blocks or standing stones. They have been long since removed, and there is no trace of them existing at present. Excavations have been made below the cromlech, and cinerary urns, with other evidence of sepulture, were found within the main chamber. At present the site is protected by a planting of fir trees, and the tenant of the adjoining cottage is the honorary caretaker of the cromlech.

8. LEGANANNY CROMLECH, DRUMGOOLAND.

SKETCH No. 8.

On the craggy southern slopes of Cratlieve mountain, in the parish of Drumgooland and townland of Legananny, the subject of this sketch stands on an exposed site, commanding an exten-

* Journal of Royal Historical and Archæological Society of Ireland. Fourth Series, Vol. V.

sive prospect to the south and west. The cap stone is shaped like a coffin, fixed north and south, eleven feet four inches long, four feet nine inches wide at the shoulder, and three feet wide at the foot or north end, in which direction it has a slope clearly due to its original construction. It is supported on three upright blocks—two at the south end measuring seven feet and six feet two inches respectively, while the upright at the north end is only four feet five inches high. This upright has been fixed on a bank as if to increase its height, and as all stand now on the bare surface, this northern prop is very unstable, and should be secured. Some years ago an urn was found in the open chamber below the cromlech. Mr. Ferguson, in his work on rude stone monuments,* gives a figure of this cromlech from a drawing by Sir Henry James, of the Ordnance Survey, and refers to it in his argumeut combating Mr. Lukis' idea that all cromlechs were originally chambered tumuli.

9. KILKEEL CROMLECH.

SKETCH No. 9.

Within a half mile of Kilkeel, in the south of Down, off the road to Newcastle, there occurs a megalithic monument known as the "Crawtee Stone," probably from the Irish word *cruit*, meaning hump, which expresses very clearly the shape of the cap stone of granite, nine feet long and eight feet six inches wide, that covers the chamber beneath, measuring about five feet six inches square, and formed of four water-worn boulders of granite, such as were, doubtless, common in this district in pre-historic times. The sketch is taken looking towards the Mourne Mountains. Some years ago, the promoters of some local building speculation debated the advisability of destroying the monument for the materials it would afford. After due deliberation they fortunately abandoned the project, not moved by the laudable desire to preserve our ancient monuments, but they yielded to the dread of unlucky consequences. A similar dread prevents timid folk passing this cromlech alone after dark.

* Rude Stone Monuments of all Countries. By J. Ferguson, D.C.L., F.R.S. London, 1872. Page 45.

10. CAUSEWAY WATER CROMLECH.

SKETCH No. 10.

The Causeway Water is a mountain stream that runs south-west along the eastern boundary of the townland of Kilfeaghan, and crosses the public road from Warrenpoint to Kilkeel, four miles from the latter place. To the west of the river, on the slope of Kurckshee, there is an excellent cromlech on a site that overlooks Carlingford Lough. A block of rounded granite ten feet long, eight feet wide, and five feet thick, weighing probably 30 tons, forms the cap stone over a chamber composed of several granite blocks on end. The site has become a rubbish-heap for ages, and all the loose field stones and other impediments to farming operations have been collected around the cromlech so far as to almost hinder the goats from taking shelter in the chamber as they were wont to do. To the east of the cromlech, and close to the bank of the river, there is another megalithic structure, more like a kistvaen, and the site around has yielded several examples of stone implements.

11. SLIEVENAGRIDDEL CROMLECH.

On the topmost peak of Slievnagriddel Mountain, within a few miles to the east of Downpatrick, there are the prostrate remains of a once standing cromlech. The blocks that composed it are now resting on the bare rock. The cap stone measures eight feet by six feet, and below it are two slabs that formed the sides of the original chamber. It is said that this cromlech was thrown down by the officials of the Ordnance Survey.

12. SAMSON'S STONE CROMLECH.

Near Downpatrick, to the south of the town, there is a large transported block known as Samson's Stone. This may be the remains of a cromlech such Mr. Du Noyer describes as "earth-fast."* The Rev. J. O'Laverty, M.R.I.A., refers to this as a "ruined cromlech." See his work on Down and Connor. Vol. 1., page 252.

* Kilkenny Archæological Society. Vol. V. New Series.

13. DROMORE CROMLECH. (?)

Taken down many years ago to supply stones for a rockery in the Palace Garden.

14. DRUMGREEN CROMLECH. (?)

Forty years ago there was a cromlech in the townland of Drumgreen, on the road from Newry to Rathfriland. A large cap stone stood on three supporters. All have been removed to make building materials and road metal.

The above list, in the opinion of the author, contains all the known cromlechs of Antrim and Down. If found imperfect, the author will be glad to receive any correction from friendly critics; and such corrections, together with any assistance rendered towards compiling a schedule of the ancient monuments of the North of Ireland, will be gratefully acknowledged.

NOTE.—This mark (?) is placed after all the cromlechs that cannot be vouched for upon the author's personal observation.

COUNTY ANTRIM.

CHAMBERED TUMULUS, CARNANMORE.

1

DOONAN FORT, TUMULUS AND KISTVEAN.

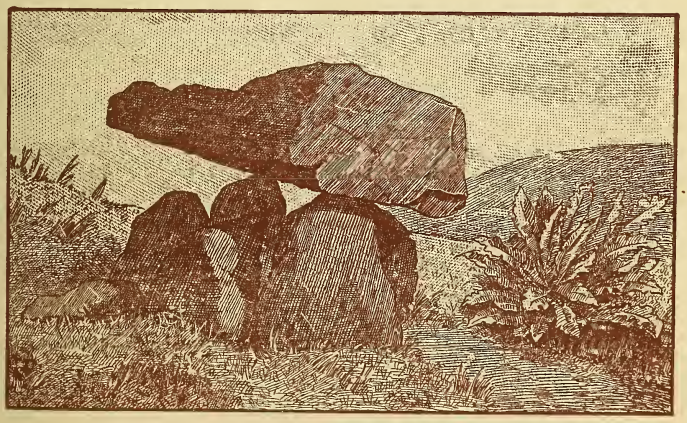
2

BRITISH MUSEUM

COUNTY ANTRIM.

KISTVEAN, ROUGHFORT.

3

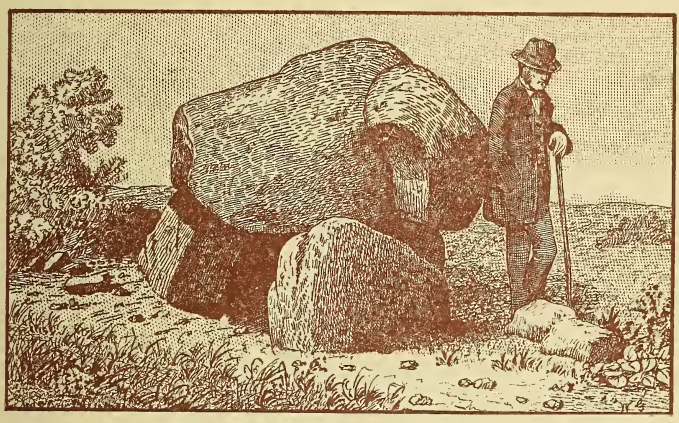


MOUNT DRUID CROMLECH, BALLINTOY.

4

NATURAL HISTO

COUNTY ANTRIM.



GLEGNAGH CROMLECH, BALLINTOY.

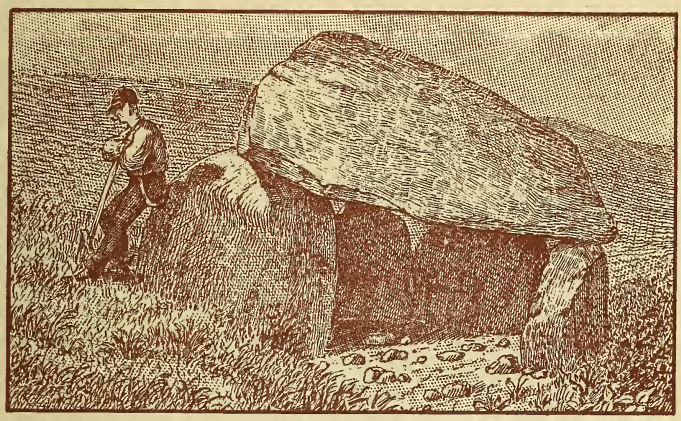
5

CLOUGHNABOGHIL CROMLECH, BALLINTOY.

6

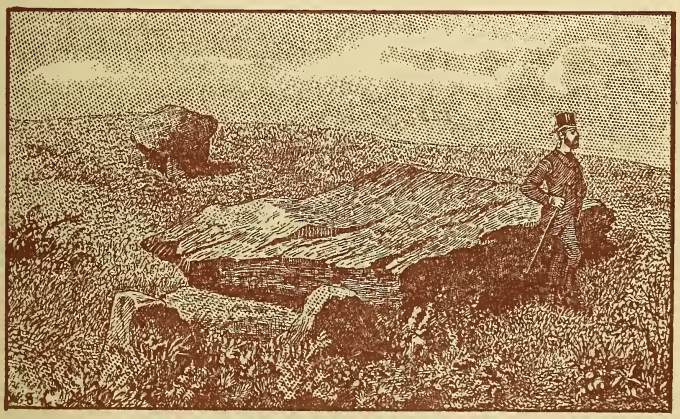
BRITISH MUSEUM

COUNTY ANTRIM.



CLOUGHANUNCHER CROMLECH, BALLYCASTLE.

7



BALLYVENNAGHT CROMLECH, BALLYCASTLE.

8

BRI
NATL HISTO

COUNTY ANTRIM.

CLOGHS CROMLECH, CUSHENDALL.

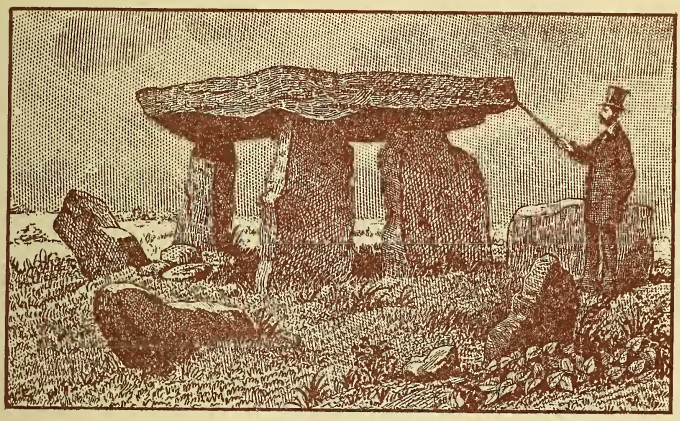
9

TICLOY CROMLECH.

10

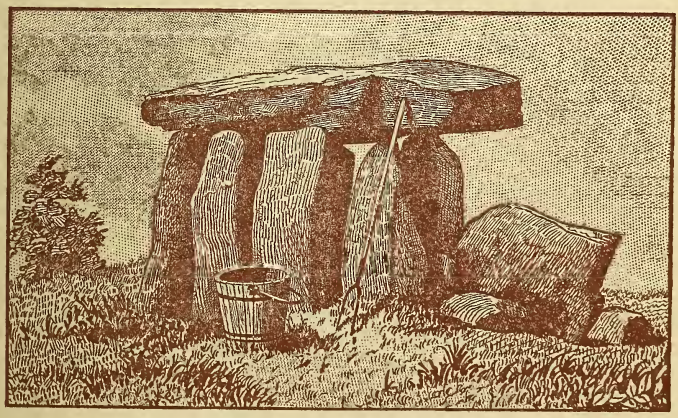
BRITISH MUSEUM

COUNTY ANTRIM.



BROADSTONE CROMLECH, CRAIGS.

11



FINVOY CROMLECH, CRAIGS.

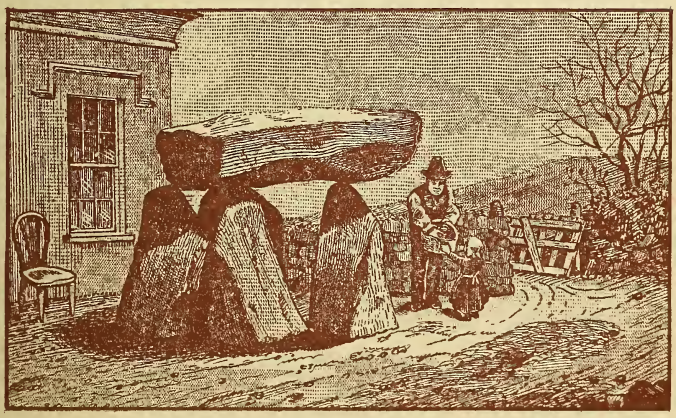
12

BRITISH MUSEUM

COUNTY ANTRIM.

CLOUGHOGAN CROMLECH, BALLYGILBERT.

13

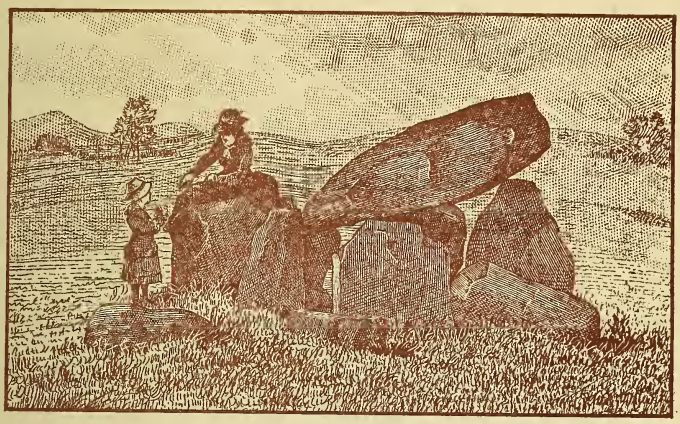


DRUIDS' COTTAGE CROMLECH, ISLAND-MAGEE.

14

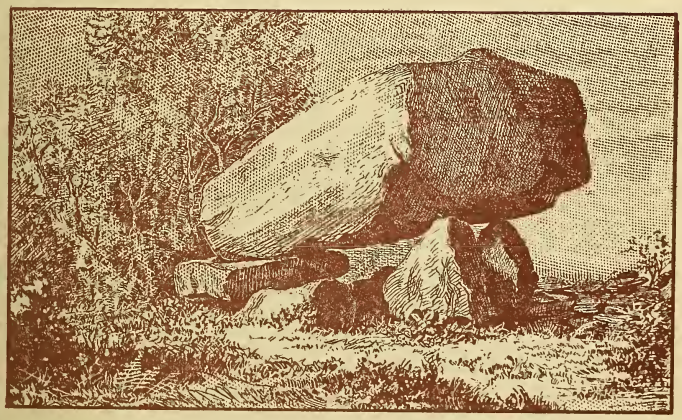
B.M.
NATURAL HISTORY

COUNTY DOWN.



GIANTS' RING CROMLECH, DRUMBO.

1

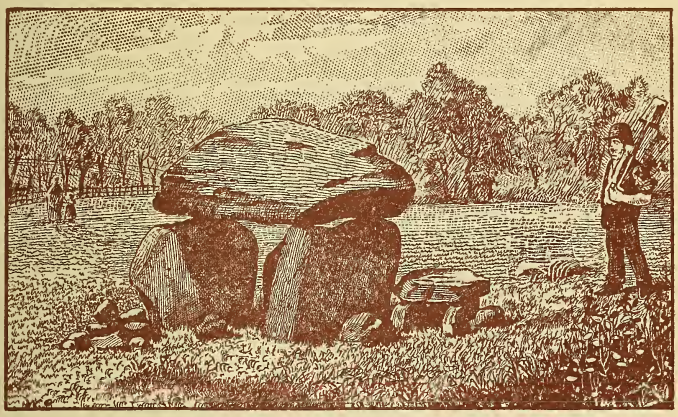


KEMPE STONE CROMLECH, DUNDONALD.

2

BRITISH MUSEUM

COUNTY DOWN.



MOUNTSTEWART CROMLECH.

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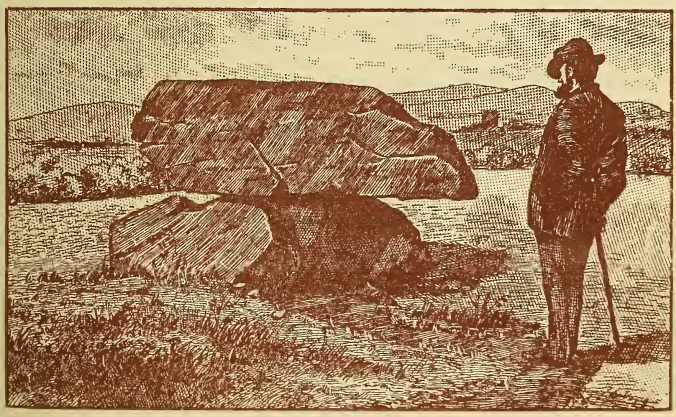

LOUGHMONEY CROMLECH.

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NATURAL HISTORY

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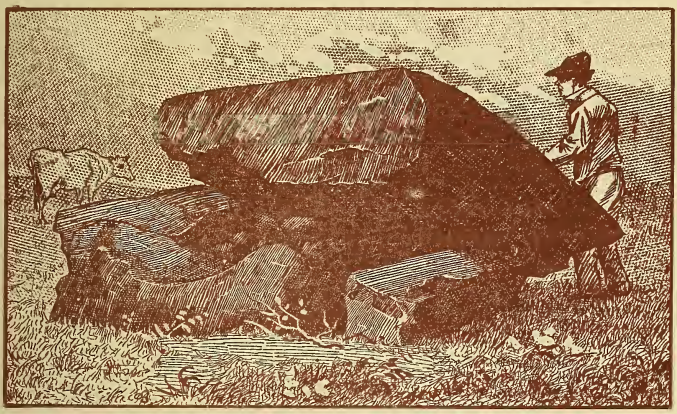

LOUGHANISLAND CROMLECH.

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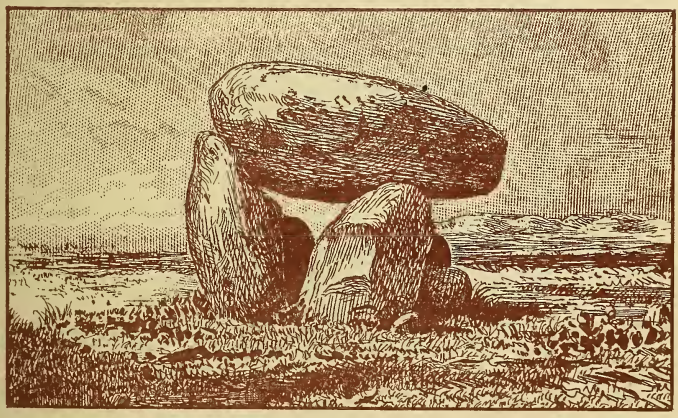

SLIDDERYFORD CROMLECH, DUNDRUM.

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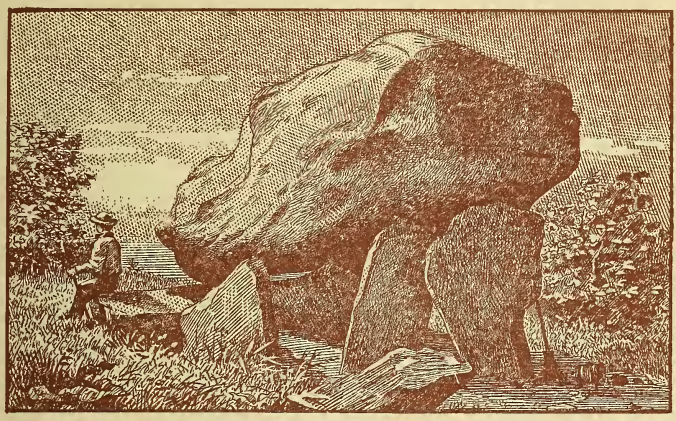
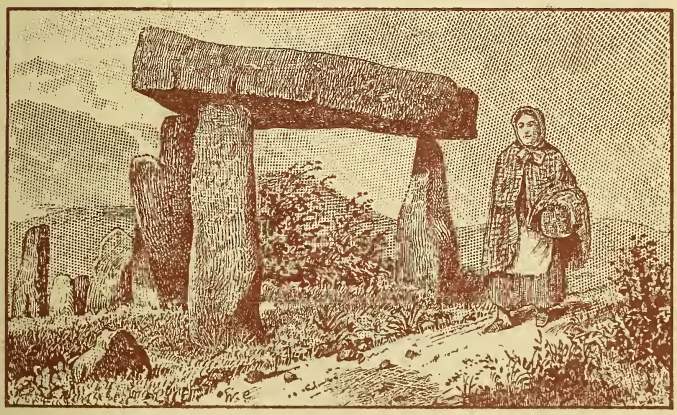
NATURAL HISTORY

COUNTY DOWN.



CLOUGHMORE CROMLECH, GOWARD.

7



LEGANANNY CROMLECH

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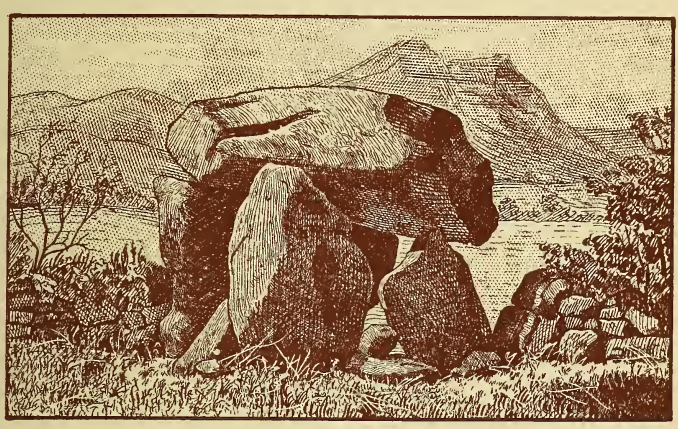
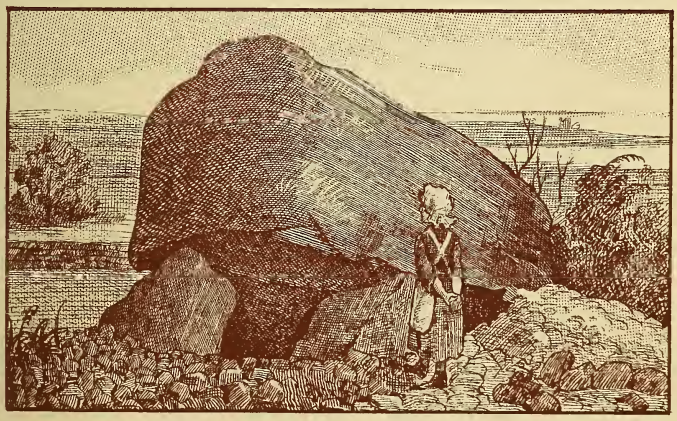
NATURAL HISTORY.

COUNTY DOWN.



KILKEEL CROMLECH.

9



CAUSEWAY WATER CROMLECH, KILFEAGHAN.

10

BRITISH MUSEUM

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1883-1884.)

NOTES ON THE

PRE-HISTORIC MONUMENTS AT CARROWMORE,

NEAR SLIGO:

BATTLE-FIELD OF THE NORTHERN MOYTURA.

BY CHARLES ELCOCK.

ABOUT two and a half miles south-west of Sligo, the high road to Seafield passes through Carrowmore, in the parish of Kilmacowen. It lies at the foot of Knocknarea, on the summit of which, at an elevation of 1078 feet above the sea, stands the large tumulus of the celebrated Queen Meave, which has served for many a century as a mark for mariners far out at sea. Carrowmore is slightly elevated above the surrounding country, and the surface is considerably undulating. The whole district, and for many miles in a line nearly north and south, inclining a little to the north-west and south-east, is covered with large, irregular, erratic blocks of coarse granite, dropped during the glacial period.

Carrowmore may be regarded as classic ground, and the antiquarian may here revel for days in examining the various rude stone monuments, such as cromleacs, cists, stone circles, tumuli,

cahirs, and forts which abound upon it. It is the site of the last and desperate battle fought by the Firbolgs,* about the year 30 B.C., just before they fled to Aranmor, where several of their stone cahirs still remain. At Carrowmore they made their last stand on the mainland of Ireland. The name of the Northen Moytura is given to the battle there fought, so as to distinguish it from a previous hardly-contested battle, fought about seven years earlier, on the plain of the Southern Moytura, close to Cong, at the north end of Lough Corrib. The monuments on the latter battle-field, though of a very different character to those at Carrowmore, are equally remarkable and interesting to the antiquary, and form a lasting memento of the fierceness of the struggle which, occupying several days, there took place. They are well described in Wilde's "Lough Corrib," the account being, perhaps, rather too florid for exactness.

The monuments on Carrowmore, of which, in 1883, sixty-three could be identified, are clustered together within a roughly oval space of about three-quarters of a mile long by less than half a mile wide. Near the centre of this is a large mound, of which the proper or original name is supposed to be lost. It is now called Listoghil, which I was told on the spot, means rye-fort. But some little investigation kindly undertaken by my friend M. J. Ward, leads him to the conclusion that its derivation is from "lis"=fort, and "toghuil"=overthrow,—the Fort of Overthrow,—which possibly may be the "real, original" name, given to mark the spot of the decisive struggle.

Listoghil is a large heap of small stones, and for many years served as a quarry for road metal. However, one day when the workmen were carting the stones away, they came upon a huge flat stone resting on several others, "like a table," and fear at once stopped any further destruction. It was evident that Listoghil was not a mere mound, but was one of the ancient

* For an examination of the question as to whether there *was a second* battle of Moytura fought—which some query—see Jubainville's "*Cycle Mythologique Irlandais*," where the whole matter, with many references, is largely gone into.

monuments of which so many lie scattered around it. In 1837 the fort (as it is called) was about one hundred and fifty feet in diameter; in 1883 it is about one hundred and twenty; originally, it was probably about fifty feet high. Two stone circles formerly surrounded Listoghil, the outer circle consisting of one hundred and fifty stones. Some of these are still standing. From the top I counted twenty-two stone circles in sight, and six cromleacs, besides the one under my feet.

The large stone, "like a table," which had become exposed, is the cap stone of a large cist, or cromleac. It is a flat limestone flag, about nine feet six inches square by one foot six inches thick. The height of the supporting stones I could not determine without excavation, which could not be undertaken. The interior of the cist or chamber is considerably filled up with boulders, which have been thrown in at the entrance to please the rustics by "the thundering noise they make." The cist was opened "some years ago" by "some distinguished man," whose name I could not learn. He brought two men with him, and they dug down inside the chamber, and found "burnt human bones, charred wood, and a large stone spear-head," which were carried off. All trace of them is now lost. I was told by the farmer, in whose fields most of these monuments stand, that burnt bones, "like horses' bones," are still found at Listoghil when a fall of the loose stones occurs.

Entrance to the cist cannot now be had without removing the stones lying about. By lying down I got my head inside, and thought I could detect some rudely incised circles on some of the stones, one circle being about ten inches in diameter. These need further investigation. Dr. Petrie's* number for Listoghil is 51.

* Dr. Petrie visited and afterwards described the Carrowmore monuments, and gave numbers to each, so as to identify them afterwards. I have made use of these; but the route he took in going over the field is very difficult to follow so exactly as to be sure we are correct, and I am not certain whether, in some instances, I may not have mistaken his number. His letter on Carrowmore is dated "12. 8. 1837." See his Life.

Walking from Sligo, the first cromleac which meets the eye is one close on the left or east side of the road. It formerly had a stone circle round it, which was cut through when making the road, and several of the stones were broken up to make the wall. Some may be seen in the wall, and one is still in the field, *in situ.* The cap stone very much resembles the top of a mushroom. It measures about twenty feet in circumference, and stands on six stones. One feature of this cromleac arrests the attention almost at the first glance. On the western side it has a sort of projecting porch-like entrance, formed by four stones—a peculiarity which is found on other cromleacs on Carrowmore. Dr. Petrie calls this No. 13. See sketch No. 1.

On the west side of the road, and almost opposite the cromleac just mentioned, is a short lane leading to a field, near the highest part of which, but not visible from the main road, stands the largest of all the Carrowmore cromleacs. Its Irish name is "Leaba na Ffian," which means the bed or grave of the warrior—a name which is given to each of the cromleacs in this group. The proverb as to the healing power of time could scarcely meet with stronger proof than that given by this Pagan monument, for the *cause* of the erection of this cromleac is now so completely forgotten in the neighbourhood, that that which is the result of bitter hatred is now known commonly as "The Kissing Stone." Swains and maidens know the reason why.

This cromleac is perfect, and stands from eight to nine feet high. The cap stone rests on three of the six stones under it, and measures about twenty-three feet in circumference, being about ten feet long. A stone circle, nearly forty feet in diameter, still surrounds the cromleac, thirty-two stones being *in situ.* The porch-like entrance is here seen also. This is the only cromleac of the group into which we can walk. Dr. Petrie calls this No. 7. See sketch No. 2.

Almost due south of this cromleac, and being but a few yards

away, easily seen from it, stands Dr. Petrie's No. 4. This cromleac is quite perfect, and stands about five feet high. There are five supports for the cap stone, which measures about fourteen feet in circumference. It stands near the middle of a field, and formerly had a stone circle around it about forty feet in diameter, consisting of forty large stones. When Dr. Petrie visited it in 1837, he found twenty-one of these still there. In 1883 these were all gone but one! On enquiring of the farmer before-mentioned how this was, he told me the twenty-one stones were all there still, but twenty had been buried by the man who held the farm before him, adding—"And he got no good by burying them." The former tenant feared to destroy the stones, and so dug a large hole at the base of each, and then tipped twenty of them into the holes made, "and there they are still," said my informant. He would have tipped over the last stone, but the agent, hearing what he was doing, came and stopped him just in time to save it. On account of the stones being "still there," though invisible, I have ventured to name this "The Cromleac of the Phantom Stones." Although there are no stones placed as a porch outside the supporting stones, yet the idea of having a special entrance is evident in the construction of the entrance. See sketch No. 3.

The remains of at least two very fine circles are near this cromleac, one of them containing a ruined cromleac, and the other having been a double circle, the outer circle being formed of very large stones. The chamber of the ruined cromleac was examined about fifty years ago by a gentleman named Walker, who found human remains in it. About a dozen were thus examined, and at least ten of them contained an interment of human remains, and in one instance the cromleac contained an urn, broken. This was found in Dr. Petrie's No. 17—a double circle.

Crossing the road again, there stands a little way south-west of the farm-house a large heap of stones which have been gathered off the land. Under this heap there is a perfect

cromleac. It was covered when Dr. Petrie visited it. His number for it is 55. This ought to be uncovered by the Board of Works, under whose care these monuments are now placed.

Not far from this heap, down in the hollow near the house, stands Dr. Petrie's No. 53. Nothing but the cromleac is now left, the circle formerly around it having disappeared through "improvements" many years ago. The cromleac stands very low, and will soon be gone from sight, as it forms a good basis for a stone-heap, such as that at No. 55. It scarcely reached higher than the top of the oats by which it was surrounded when I saw it. See sketch No. 4.

In the next field to the south are a great number of circles; one in the east corner is formed of very large stones, and near it on the south-west is a fine large "giant's grave," or stone cist. Half of Listoghil stands in the field, and two cromleacs also.

The nearest to us is Dr. Petrie's No. 52. It is a large cromleac, with a conical cap stone, flat underneath. Query, was it a double cromleac? The porch-like entrance is very marked, unless what looks like a porch may be the supports of a second cromleac, of which the cap stone is gone. A circle formerly surrounded this cromleac, but only one stone is now standing, and this is not in its original place. My informant once saw this stone being moved away, and he put it back as near as he could. There is a gentle incline of earth and stones up to the top of the supports of the cap stone, looking like an inclined plane, up which the cap stone was pushed into position, but I do not think it was formed for that purpose, though I could not learn whether it had been formed by throwing the stones there which were cleared out of the land. See sketch No. 5.

Passing by Listoghil on our left, we see below us on the south, Dr. Petrie's No. 48. This cromleac is perfect, the cap stone being about six feet square, but is nearly level with the ground. At a distance of thirty-eight feet from it stands a

large solitary pointed stone, five feet high, the only one left of what must have been a magnificent circle, about eighty feet in diameter. See sketch No. 6.

Double circles, with ruined cromleacs, are seen west of this in the same field.

Near the pond, at the bottom of the hollow, there is what appears to be a cist of unusual construction. There is a very large flag-like stone, flush with the surface, under which is a hollow space. I pushed my umbrella into it, through an opening on one side, and could swing it about. It was too dark inside to see anything. The peculiar feature is this:—On the *top* of the flag, and placed round it, resting partly on the flag and partly on the surrounding soil, are a number of large stones, as if put there to keep the flag down and prevent its being raised. What can this be? I have never seen any similar structure.

Just over the wall, in the field at the top of the hill, is seen a very remarkable cashel or fort. It may be called roughly square, the sides being about one hundred and twenty feet long. The circumscribing walls are perhaps ten feet thick, and are made up of earth and massive stones. There are two entrances on opposite sides, north and south. The interior is divided by cross walls at right angles, and there appears to have been a cist or structure of some sort in it. There are a ditch and bank outside the wall. Altogether, it is very difficult to say what this really was, its appearance being so very different to what is usually found in forts, &c., and excavation would be necessary to settle the question whether this was a place of sepulture or not. Can it have been the great Firbolg stronghold? Dr. Petrie numbers it 46.

Leaving the cashel and passing to the east, in the direction of Cloverhill, keeping near the wall, we soon come upon the last of the perfect cromleacs left on Carrowmore. It is Dr. Petrie's No. 37. It stands in the centre of a triple series of circles still there. The cromleac is small, the cap stone being about sixteen feet in circumference, and resting on five stones.

The porch is very striking. The smallest circle is forty feet in diameter, and consists of small stones, much covered by the grass, so as to be nearly hidden. The middle circle is eighty feet in diameter, and is formed of twelve large stones. The outermost circle is one hundred and twenty feet in diameter, and is composed of twelve much larger stones, some of which have been displaced. See sketch No. 7.

This list mentions all the cromleacs which are perfect in 1883. Ruins and traces of others, with single, double, and even triple chambers in them, are numerous, no less than twenty being traceable, though many more formerly stood on Carrowmore.

There is one very fine circle not far from No. 37, some of the stones of which stand seven feet above ground. Three or four have slipped from their places owing to the carting away of the gravel from the mound on which the circle stands. There are traces of cists or cromleacs within this circle, and on stamping the ground, it sounds as if hollow. Originally "over fifty" stones stood round the edge of this circle, which is seventy to eighty feet in diameter.

In a field about three hundred yards east of this circle, and on the left of the road to Cloverhill, is a stone cist. The tops of the stones are level with the ground. Some of the stones are carved with very rude scribings, and one at the entrance has on the edge what looks very much like an Ogham inscription. The drawings of these sculptures in Ferguson's "Rude Stone Monuments" are not correct.

At the extreme northern end of the battle-field is still to be seen the well of very fine water, never known to be dry, at which the Firbolgs are said to have drunk on the day of the battle. Its Irish name is "Tober na Ffian,"—the Warrior's Well.

A very short distance north of the Well stands a very remarkable solitary stone. It is called "Cloch-breac," The Grey [or Speckled] Stone. It is a flagstone standing on

edge, measuring nearly ten feet above ground, and as wide as high: its thickness is about seven inches. It has a large quadrangular hole cut through it, large enough for a man to creep through with ease. It forms a "mearing point" for the three adjoining parishes. Why it was erected, or when, is quite lost, and I could learn no tradition respecting it. Is it one of the old Pagan oath stones, such as the Maen-an-Thol, in Cornwall, or as "The Long Stone" at Minchinhampton, in Gloucestershire? Besides being used for swearing, such stones were used for curing children who had the measles, whooping-cough, &c., by passing the child through the hole! A superstition which it is hoped is now quite gone.

There is yet one more of the antiquities in Carrowmore which must be mentioned, although properly speaking not exactly belonging to the Moytura monuments. This is The Caltragh, a large Pagan burying ground, about a quarter of a mile due east of Cromleac No. 13. It may be seen from the field in which this cromleac stands, and from Listoghil. The Caltragh is an irregularly circular mound, about one hundred and fifty yards in diameter, enclosed by a wall. Some slight excavations made here and there many years ago, showed it to be full of human bones. The examination was difficult, owing to the prejudices of the neighbourhood. No burial has ever taken place there within the reach of tradition, and the ground is regarded as under a sort of *taboo*. Undoubtedly it dates from a very remote antiquity—probably much older than the Carrowmore monuments.

The whole of these monuments are included in the Act for the Preservation of Ancient Monuments.

There is now little doubt that the stone enclosures known as Druidical Circles, Druid's Altars, and such like, are invariably sepulchral, with which the Druids had no sort of connection as to worship. The stone circles in all probability mark the burial places of the common soldiers who fell in the battle, and the cromleac in the centre, the grave of the chieftain—the

"great man" who commanded them. Almost invariably, wherever examined, traces of human interments have been found in both. This is borne out by the ancient Irish name for all the Carrowmore monuments—the graves or beds of the warriors.

Such of our members who may be in Sligo may count on a day of exceeding interest and instruction by paying a visit to Carrowmore. Out of Brittany, there is no other collection of such antiquities known to equal it in the world.

Works of reference in connection with the subject :—

Ferguson's Rude Stone Monuments.
Dr. Petrie's Life and Letters.
The Book of Fenagh.
Dunraven's Notes on Early Irish Architecture.
Jubainville's Le Cycle Mythologique Irlandais, chaps. vii., viii.
Wilde's Lough Corrib.
Wood-Martin's History of Sligo.—This book contains the most recent information about Carrowmore.

CHARLES ELCOCK.

BRITISH MUSEUM

Presented
11 FEB 1886
Issued with Vol. ii. pt 4.

CARROWMORE, CO. SLIGO.

CROMLECH, *Dr. Petrie's, No.* 13.

1

THE KISSING-STONE, *Dr. Petrie's, No.* 7.

2

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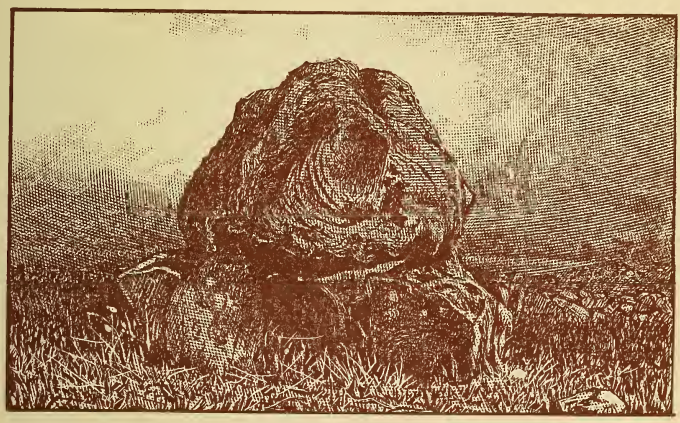

THE CROMLECH OF THE PHANTOM STONES, *Dr. Petrie's, No.* 4.

3

CROMLECH, *Dr. Petrie's, No.*

4

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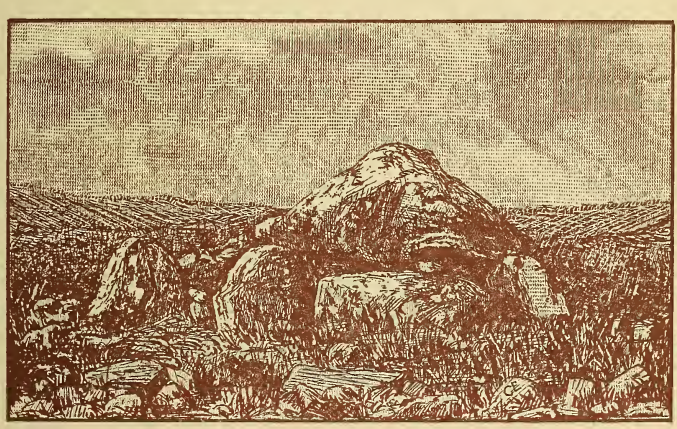

CROMLECH, *Dr. Petrie's, No.* 54.

5

CROMLECH, *Dr. Petrie's, No.*

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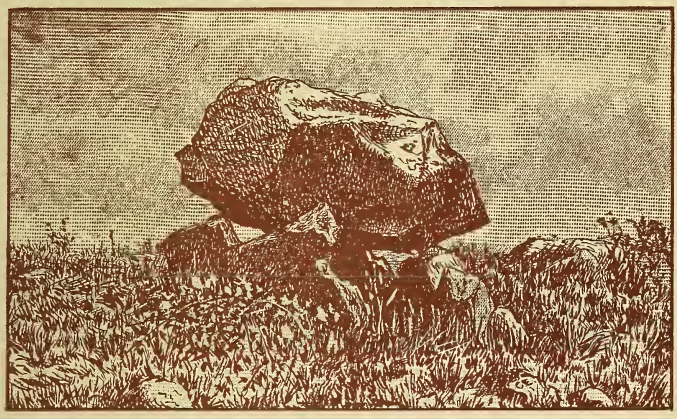

CROMLECH, *Dr. Petrie's, No.* 37.

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APPENDIX IX.

✠✠✠✠✠✠

I. RECENT OSTRACODA OF BELFAST LOUGH.

BY SAMUEL M. MALCOMSON, M.D.

II. THE FUNGI OF THE NORTH OF IRELAND.

BY HENRY WILLIAM LETT, M.A., Trin. Coll., Dublin.

III. FORAMINIFERA

OF THE BELFAST NATURALISTS' FIELD CLUB'S CRUISE OFF BELFAST LOUGH IN THE STEAM-TUG "PROTECTOR," JUNE, 1885; ALSO, FORAMINIFERA FOUND BY DR. MALCOMSON, AT ROCKPORT, BELFAST LOUGH.

BY JOSEPH WRIGHT, F.G.S.

IV. A LIST OF THE CRETACEOUS FORAMINIFERA

OF KEADY HILL, COUNTY DERRY.

BY JOSEPH WRIGHT, F.G.S.

V. A LIST OF IRISH COLEOPTERA,

BY ROBERT PATTERSON, F.R.S.

EDITED BY S. A. STEWART, F.B.S., Edin.

PUBLISHED BY

THE BELFAST NATURALISTS' FIELD CLUB.

January, 1886.

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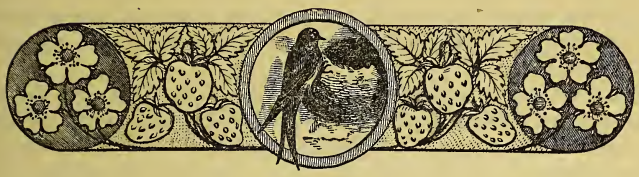


RECENT OSTRACODA OF BELFAST LOUGH.

By SAMUEL M. MALCOMSON, M.D.

As very few Ostracoda have been recorded from the North of Ireland, and as no systematic list of the species inhabiting Belfast Lough and its neighbourhood has ever been made out, I determined some years ago to examine all the material containing them which I could obtain, with a view to supplying this deficiency.

When I mentioned my project to Mr. Joseph Wright, F.G.S., he very kindly offered to place at my disposal all the material dredged by himself and Mr. Wm. Swanston, F.G.S., from the examination of which he had compiled the extensive list of Foraminifera published in an appendix to the proceedings of the Belfast Naturalists' Field Club for 1876-77. To these valuable dredgings I have added one gathering of my own, consisting of shore sand from Rockport, County Down, and also the dredgings taken at the Field Club excursion in the steam tug "Protector," in 1885.

Want of time has prevented the examination of Mr. Wright's entire series of dredgings, but those already done seem to give a fairly representative list of the Belfast Lough species, and as Strangford Lough has not yet been systematically dredged, I have considered it better not to incorporate the gatherings from that locality in the present list.

Altogether, gatherings from twenty-one stations have been examined. Eleven of these situated in the Irish Channel, just outside the mouth of Belfast Lough, were all, except three, in moderately deep water (30 to 72 fathoms).

Five of the stations were in Belfast Lough itself, and all in shallow water (4 to 10 fathoms), while the remaining five stations were situated on the beach, and consisted of shore gatherings, taken from the surface of the sand or from rocky pools between tide marks.

These gatherings altogether have yielded 100 species of marine Ostracoda,

as well as five fresh water species,* which were found in the shore gatherings, but these had evidently been carried down by streams, and consequently have not been included in the present paper.

Two tables are appended—one giving particulars of depth, locality, nature of sea bottom, quantity of material examined, and number of species found in each gathering; and the other showing the distribution and comparative rarity of each species.

I am very deeply indebted to G. S. Brady, M.D., F.L.S., for the great assistance he has rendered me in the identification of many doubtful specimens, and for the valuable information he has given me about some of the more interesting species.

I must also thank my friend, Mr. Joseph Wright, for his kindness in placing his gatherings in my hands, and Mr. David Robertson, F.G.S., of Glasgow, for his help in determining some of the critical species.

The following species deserve special notice:—

Paracypris polita, *G. O. Sars.* Only two or three single valves of this species were found, all of them in one locality—viz., Brown's Bay, Islandmagee, one of the excellent shore gatherings collected for Mr. Wright's paper by Mr. Gray, M.R.I.A.

Bairdia inflata, *Norman.* This species seems to be fairly common in the Irish Channel, but only one valve was found in Belfast Lough, and that one at White Head, which is almost at the mouth of the Lough.

Bairdia obtusata, *G. O. Sars.* Only two specimens of this very rare species were found, both in the "Protector" dredgings.

Cythere cribrosa, *B. C. and R.* I have only seen one specimen of this species. It has not been previously found in the recent state, but occurs fossil in the Post-tertiary deposit at Bridlington, Yorkshire.[1]

Cythere Cluthæ, *B. C. and R.* Although rare, this species seems to be generally distributed in the deeper water. Recent specimens have not been previously recorded, but fossil ones occur in several post-tertiary deposits.[2]

Cythere Dunelmensis, *Norman.* This species seems to inhabit only a very limited area in Belfast Lough, as it has been found in only two gatherings, taken from stations which were close together—viz., off Rockport, 4 fathoms, and Rockport shore sand. It is usually found in much deeper water, and is not a littoral species. I think it is probable that the shore sand specimens have been washed up by some current,

* Potamocypris fulva, *Brady*; Cypris tumefacta, *B. and R.*; Cypridopsis villosa (*Jurine*). Candona albicans, *Brady*, and Candona compressa (*Koch*).

(1.) See Post. Tert. Entom. Scotland, p. 146.

(2.) See Post. Tert. Entom. Scotland, p. 153.

although they do not appear much worn; but as several other species of Ostracoda, as well as Foraminifera, which usually inhabit deeper water, have been found in this locality, I think some such supposition is rendered likely.

Cythere (?) acerosa, *Brady.* Although extremely rare, this species seems to be widely distributed in the deeper water outside Belfast Lough, having been found in no less than five gatherings.

Cytheridea subflavescens, *Brady.* Five or six typical specimens of this extremely rare species have been found.

Lopoconcha cuneiformis, *n. sp. Brady MS.* (Plate xxv., figs. 1-2.) Only one specimen, a male, of this species has been found. Carapace of male, as seen from the side, oblong, subrhomboidal, higher in front than behind, greatest height equal to half the length; anterior extremity broad, marked with a few radiating hair-like lines, well rounded below, and sloping steeply backwards above, where it forms an obtuse angle with the dorsum; posterior narrow, and obliquely rounded below; superior margin straight, inferior slightly sinuated in front of the middle, and produced into a thin laminar process behind, which is continued round the posterior border. Outline, as seen from above, cuneate, greatest width in front of the middle, and scarcely equal to height; acutely pointed in front, somewhat more obtusely behind. Shell pellucid, polished, thickly covered with very fine puncta, and a few distinct elevated papillae.

Cytheropteron Montrosiense, *B. C. and R.* Only a single valve of this species has been found.

Bythocythere pavo, *n. sp. Brady MS.* (Plate xxv., figs. 5-7.) Only six specimens of this species have been seen, all from the dredging off Black Head. It has been previously found by Dr. Brady and the Rev. A. M. Norman, but has not been described. Carapace of female, as seen from the side, oblong, subquadrilateral; nearly equal in height throughout; height equal to half the length, extremities rounded; superior margin straight, inferior slightly sinuated in the middle. Seen from above ovate, greatest width behind the middle, and nearly equal to half the length; anterior extremity muncronate, posterior evenly rounded. End view triangular, with rounded angles; height slightly greater than width. Surface of shell thickly covered with fine punctures and large white papillae. Length, 1-100th inch. Dr. Brady informs me that most of his specimens have a slight lateral crest, which mine do not show.

Cytherideis foveolata, *Brady.* (Plate xxv., figs. 8-12.) This species, which has not been previously found in Britain, seems to be confined to

the deeper water, although the first specimen was in shore sand from Portrush, where it had probably been washed up. Dr. Brady informs me that my specimens differ from the types obtained by him from the Gulf of St. Lawrence, in being rather stouter, less depressed in front, less distinctly punctated, rather smaller, and in having the ventral overlap of the valves in the opposite direction.

Paradoxostoma truncatum, *n. sp.* (Plate xxv., figs. 3-4.) About a dozen specimens of this species have been found in a single locality off Coalpit Bay, but it has not been seen anywhere else. Carapace, as seen from the side, compressed, irregularly ovate, greatest height in the middle, and equal to rather more than half the length. Anterior margin nearly straight, and sloping upwards almost at right angles to the anterior part of the dorsal margin; posterior extremity evenly rounded. Superior margin well arched, sloping somewhat steeply in front; inferior sinuated in front of the middle. Outline, as seen from above ovate—extremities pointed, widest in the middle; greatest width equal to rather more than one-third the length. Valves pellucid, white, or slightly ochreous. Length, 1-60th inch.

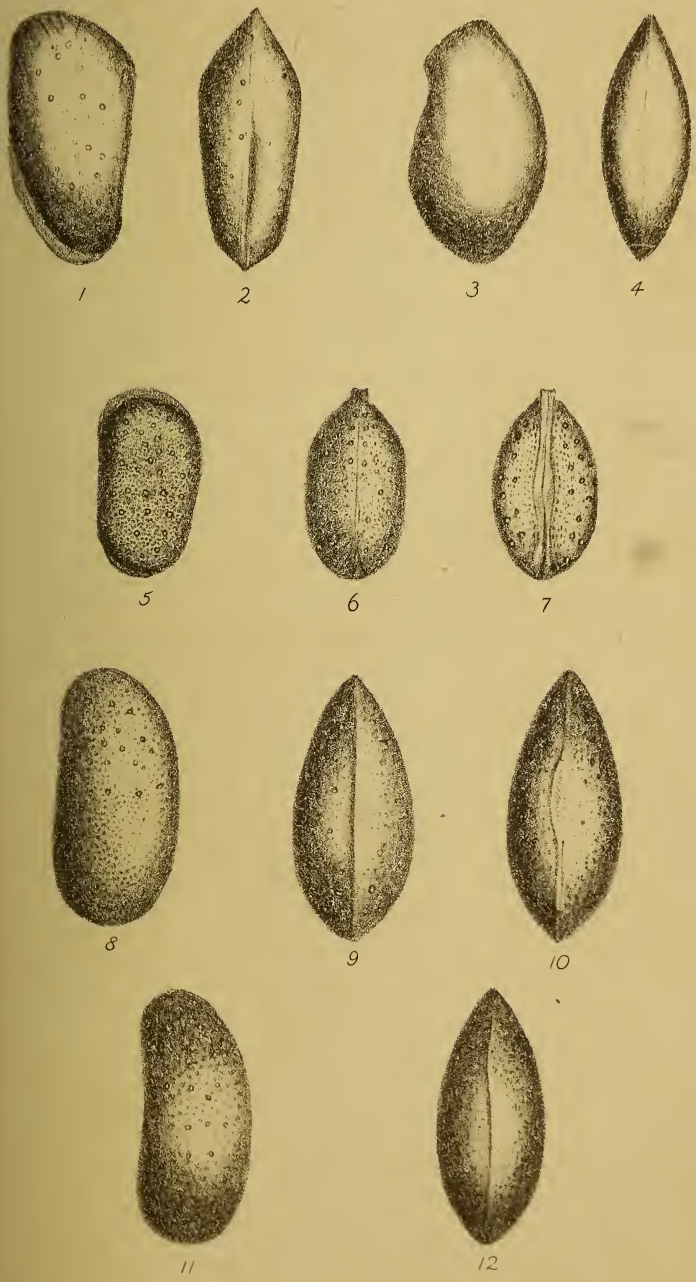
Cytherella Scotica, *Brady.* Only a single valve of this species has been found.

TABLE GIVING PARTICULARS OF DEPTHS, &c., OF THE STATIONS.

	LOCALITIES.	Depth in fathoms.	Sea Bottom.	Quantities of material examined.	Number of species from each locality.
Irish Channel. "Protector" dredgings	Five miles S.S.E. of Maidens Light-houses ..	60	Muddy sand.	No record kept.	51
	Two miles S. of Maidens Light-houses ..	60	ditto.		30
	Four miles E. of Gobbins	60	ditto.		43
	Six miles E.S.E. of Blackhead	30	Sand.		41
	Two miles S.S.E. of Maidens Light houses ..	72	Sand and zoophites.	11 oz.	31
	Three miles S.S.E. of Maidens Light-houses ..	62	Sand.	5 lbs 13 oz	45
	Two miles S. of Maidens Light-houses ..	60	Sand.	8 lbs	46
	Two miles N.E. of Muck Island	50	Stones and shells.	4 oz	7
	One mile off Blackhead and Gobbins ..	15-18	Mud, sand, shell, & Polyzoa, several gatherings.	6 lbs 5 oz	56
	Quarter mile off Coalpit Bay	13	Sponges.	7 oz	35
	Between Copeland Islands and land ..	6	Sand and broken shells.	——	9
Belfast Lough.	Off Whitehead	10	Sand and dead shells.	3 lbs	62
	Off Whitehead	8	Muddy sand.	13 lbs 12 oz	53
	Off Greypoint, mid-channel	6	Sand and dead shells.	3 lbs	30
	Off Rockport.	4	ditto.	9 oz	24
	Bangor Bay	5	ditto.	9 oz	15
Shore Gatherings.	Holywood Bank..	Between tides.	Fine sand.	8 lbs	23
	Rockport, County Down	ditto.	Coarse sand from rock pools.	20 lbs	69
	Donaghadee	ditto.	Fine sand.	8 lbs	32
	Between Carrickfergus and Kilroot	ditto.	ditto.	8 lbs	36
	Brown's Bay, Islandmagee	ditto.	Sand.	1 lb 1 oz	56

EXPLANATION OF PLATE XXV.

Fig. 1. *Loxoconcha cuneiformis.*	Carapace of male, seen from left side
Fig. 2. ,,	Carapace of male, seen from above
Fig. 3. *Paradoxostoma truncatum.*	Carapace of female, seen from left side.
Fig. 4. ,,	Carapace of female, seen from above.
Fig. 5. *Bythocythere pavo.*	Carapace of female, seen from left side.
Fig. 6. ,,	Carapace of female, seen from above.
Fig. 7. ,,	Carapace of female, seen from below.
Fig. 8. *Cytherideis foveolata.*	Carapace of female, seen from left side.
Fig. 9. ,,	Carapace of female, seen from above.
Fig. 10. ,,	Carapace of female, seen from below.
Fig. 11. ,,	Carapace of male, seen from left side.
Fig. 12. ,,	Carapace of male seen from above.



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MALCOMSON _ OSTRACODA OF BELFAST LOUGH

BRITISH MUSEUM
NATURAL HISTORY.

TABLE SHOWING THE DISTRIBUTION OF OSTRACODA IN BELFAST LOUGH.

Species marked * are new to the British Fauna. Abbreviations—v r, very rare; r, rare; f, frequent; c, common; v c, very common.

LIST OF SPECIES.	IRISH CHANNEL. "Protector" Dredgings.										BELFAST LOUGH.					BETWEEN TIDES.				
	5 Miles S.S.E. of Maidens Light Houses. 60 fms.	7 Miles S. of Maidens Light Houses. 60 fms.	4 Miles E. of Gobbins. 40 fms.	6 Miles E.S.E. of Black Head. 30 fms.	2 Miles S.S.E. of Maidens Light Houses. 22 fms.	3 Miles S.S.E. of Maidens Light Houses. 22 fms.	7 Miles S. of Maidens Light Houses. 30 fms.	12 Miles N.E. of Mock Island. 30 fms.	1 Mile off Black Head and Gobbins. 15 to 18 fms.	4 Mile off Cosgit Bay. 18 fms.	Between Copeland Islands and Lamb. 6 fms.	Off White Head. 10 fms.	Off White Head. 8 fms.	Off Gray Point—Mid-Channel. 6 fms.	Off Rockport. 4 fms.	Bangor Bay. 3 fms.	Holywood Bank.	Rockport, Co. Down.	Donaghadee.	Between Carrickfergus and Kilroot.	Brown's Bay, Island Magee.
SECTION PODOCOPA.																					
FAMILY CYPRIDÆ.																					
Paracypris, *G.O., Sars.*																					
polita, *G. O. Sars.* 1865, Oversigt af Norges, marine Ostracoder, p. 12.	...	..	...	...	...	...	...	...	...	...	..	...	...	...	...	..	...	...	...	...	v r
Argillœcia, *G.O., Sars.*																					
cylindrica, *G.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 12.	...	...	...	v r	...	...	v r	...	...	...	..	r	...	...	...	...	...	v r	...	...	v r
Pontocypris *G.O., Sars.*																					
mytilicides, (*Norman*). 1862. Cythere mytiloides Norman, Ann. and Mag. N.H., Vol. IX., p. 49. pl. iii.	v r	v r	c	...	...	v r	c	..	c	v r	...	f	v c	...	...	...	v r	...	..	...	r
trigonella, *S.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 16.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	c	...	...	...
Bairdia, *McCoy.*																					
inflata, (*Norman*). 1862, Cythere inflata, Norman, Ann. and Mag. N.H., Vol. IX., p. 49, pl. iii.	c	v r	c	v r	...	v r	v r	...	v r	...	...	v r	..	...	...	...	...	...	...	...	...
obtusata, *G.O., Sars.* 1865, Overs. Norg mar. Ostra., p. 24.	...	v r	v r	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
FAMILY CYTHERIDÆ.																					
Cythere, *Müller.*																					
pellucida, *Baird.* 1850, Brit. Entom., p. 173, pl. xxi.	c	c	c	c	...	f	c	...	v c	v r	...	v c	c	v c	v c	v c	...	v c	v c	...	c
castanea, *G.O., Sars.* 1865. Overs. Norg. mar. Ostra., p 32	...	...	...	...	...	...	...	...	v r	...	...	v r	v r	...	r	c	v c	c	c	r	f
Macallana, *B. and R.* 1869, Ann. and Mag. N.H., ser. 4, vol. III., p. 368. pl. xix.,	...	...	...	...	.	...	...	...	...	...	...	...	...	...	...	...	r	c	f	v c	...
porcellanea, *Brady.* Ann. and Mag. N.H., ser. 4, vol. III., p. 17. pl. vii.	...	...	...	...	...	...	...	...	...	...	...	f	...	...	v r	...	c	c	c	v c	...
tenera. *Brady.* 1868, Monog Rec. Brit Ostra., p. 399, pl. xxvii.	c	v c	v c	c	v c	v c	c	...	v c	v c	...	c	c	v c	c	c	v r	v c	f	v r	c
*eriboea. *B. C. and R.* 1874, Monog. Post. tert. Entom. Scotland, p. 146. pl. x.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	v r	...	...	...
crispata. *Brady.* 1868, Ann. and Mag. N.H., ser. 4, vol. II., p. 221	r	r	...	v r	...	v r	v r	..	v r	...	...	v r	r	...	v r	...	c	c	...	v r	c
badia. *Norman.* 1862, Ann. and Mag. N.H., vol. IX., p. 48, pl. xiv.	v r	...	...	...	...	...	...	..	...	...	...	...	f	...	v r	...	...	f	...	...	v r
viridis, *Müller.* 1785. Entomostraca. p. 64, tab. vii.	c	r	v c	r	...	f	c	...	v r	v r	...	f	c	...	...	..	v c	v c	c	v c	v c
lutea. *Müller.* 1785, Entomostraca. p. 65, tab. vii.	v r	c	v r	...	r	v r	v r	...	v r	r	r	...	c	...	...	...	v c	c	v c	c	c
albomaculata, *Baird.* 1850, Brit. Entom., p. 169, pl. xx.	...	...	...	...	...	...	r	...	...	...	...	...	...	...	v r	...	v r	v c	v c	c	f
gibbosa, *B. and R.* 1869, Ann and Mag. N.H., ser. 4, vol. III., p. 368, pl. xxi.	v r	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	v r	...	...	...
convexa, *Baird.* 1850, Brit. Entom., p. 174, pl. xxi., fig. 3.	v r	v r	...	...	v r	v r	r	...	v r	c	...	r	r	c	r	...	...	v c	v c	...	v c
rubida, *Brady.* 1868, Monog. Rec. Brit. Ostra., p. 400, pl. xxxii.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	v r	...	...	...
*Clathræ. *B. C. and R.* 1874, Monog. Post. tert. Entom. of Scotland, p. 153. pl. xiii.	v r	...	...	...	v r	v r	c	...	...	v r	...	r	v r	..	...	...	...	...	...	...	...
Finmarchica, *G.O., Sars.* 1865, Cythereis finmarchica, *Sars*, Overs. Norg. mar. Ostra., p 41.	r	...	v r	v r	r	r	c	...	c	...	...	v r	...	...	...	...	...	...	...	...	c
cuneiformis. *Brady.* 1868, Monog. Rec. Brit. Ostra., p. 404, pl. xxxi.	v r	...	v r	..	..	v r	...	...	v r	...	...	v r	r	...	...	...	...	f	...	f	f
limicola, (*Norman*). 1865. Cythereis limicola, Norman, Nat. Hist., Trans. Northumberland and Durham, vol. I., p. 20, pl vi	...	...	...	...	...	...	...	...	v c	...	...	f	v r	c	...	...	...	...	...	...	...
globulifera, *Brady.* 1868. Monog Rec. Brit. Ostra., p. 406, pl. xxxi.	...	...	...	...	v r	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	..
navicula, (*Norman*). 1868, Cytherura navicula, *Norman*, Brit. Ass. Report. 1868, p. 247	...	v r	v r	v c	...	...	...	...	v r	...	...	v r	...	...	...	...	...	v r	...	...	...
pulchella, *Brady.* 1868, Monog. Rec. Brit. Ostra., p. 404.	v r	...	...	...	...	...	...	...	c	...	...	v r	c	v r	...	...	...	v r	...	v r	r
villosa, (*G.O., Sars*). 1865, Cythereis villosa. *G.O.*, Sars, Overs. Norg mar. Ostra., p. 42.	c	r	v c	c	r	r	r	...	r	v c	...	v r	v c	c	v r	...	v c	v c	c	v r	f
laticuma, *Brady.* 1868. Monog. Rec. Brit. Ostra., p. 412, pl. xxxi.	..	...	v r	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Robertsoni. *Brady.* 1868, Ann. and Mag. N.H., ser. 4, vol. II., p. 33, pl. iv.	r	...	...	v r	...	v r	...	...	...	...	..	v c	r	f	...	...	...	v c	v c	v c	v c
[illegible] 1856, Monog. Tert. Entom., p. 29, pl. iv.	...	...	...	...	...	...	...	..	v c	v r	...	f	c	v c	...	...	...	r	...	...	c
cinaciata, *Brady.* 1866, Brit. Ass. Report, p. 210.	v r	...	...	v r	..	..	...	...	v r	...	...	v r	...	..	...	...	...	...	...	...	v r
quadridentata, *Baird.* 1850, Brit. Entom p. 173, pl. xxi.	...	...	...	...	...	...	...	...	v r	...	...	v r	...	...	...	v r	...	...	...	...	v r
angulata, (*G.O., Sars*). 1865, Cythereis angulata, Sars, Overs. Norg. mar. Ostra., p. 40	v r	v r	..	...	...	...	...	...	...	...	...	...	c	c	...	...	...	v c	c	v r	c
tuberculata. (*G.O., Sars*). 1865, Cythereis tuberculata, *Sars*, Overs. Norg. mar. Ostra., p. 37	v r	..	...	v r	...	...	...	...	v c	..	...	v c	c	r	r	...	...	c	..	v r	v c
Dunelmensis, (*Norman*). 1865. Cythereis Dunelmensis Norman, Nat. Hist. Trans. Northumberland and Durham, vol. I., p. 22, pl. vii.	...	...	...	...	...	...	...	...	...	...	..	...	...	...	v r	...	...	r	...	...	...
Whiteii. (*Baird*). 1850, Cythereis Whiteii Baird, Brit. Entom., p. 175. pl. xx.	...	...	...	...	..	...	...	...	...	...	...	...	..	...	...	...	...	...	...	..	v r
antiquata. (*Baird*). 1850, Cythereis antiquata Baird, Brit. Entom., p 176. pl. xx.	v r	..	v r	...	...	...	...	...	v c	...	...	v c	r	v c	...	r	...	r	...	...	f
Jonesii. (*Baird*). 1850, Cythereis Jonesii Baird, Brit. Entom., p. 175. pl. xx.	...	...	v r	...	...	...	...	...	c	...	...	f	v r	v r	v r	...	..	v r	...	...	...
(?) semipunctata, *Brady.* 1861, Monog. Rec. Brit. Ostra., p. 41, pl xxix.	...	...	v r	...	...	v r	...	...	v r	...	...	...	r	...	...	...	...	r	r	v r	v c
(?) acerosa, *Brady.* 1868, Monog Rec. Brit. Ostra., p. 419, pl. xxxi.	v r	v r	v r	v r	...	...	v r	...	...	...	...	...	..	...	...	...	...	...	...	...	...
Cytheridea, *Bosquet.*																					
papillosa, *Bosquet.* 1852, Entom. foss. terrtertiair France, p. 42, pl. ii	...	v r	...	...	v r	...	v r	...	v c	...	...	c	r	c	..	...	...	v r	...	..	...
cornea. *B. and R.* 1869, Ann. and Mag. N.H., ser. 4, vol. III., p. 370, pl. xix.	v r	...	...	v r	...	v r	..	...	r	...	...	v r	...	...	...	...	...	v r	...	c	c
elongata. *Brady.* 1868, Monog. Rec. Brit. Ostra., p 241, pl. xxviii.	...	..	...	...	...	...	r	...	v r	...	...	...	...	...	...	...	v r	v c	...	r	v c
subflavescens. (*Brady*). 1866, Cythere subflavescens, Brady, Brit. Assoc. Report, p. 210.	...	...	...	...	v r	...	...	...	v r	...	...	v r	..	...	...	...	...	...	v r	...	...
Eucythere, *Brady.*																					
declivis. (*Norman*). 1864, Cythere declivis. Norman, Nat. Hist. Trans. Northumberland and Durham, vol. I., p. 16, pl. v.	v r	r	c	c	v r	f	c	...	f	v r	...	v c	v c	v c	r	v r	v r	v c	c	r	v c
Loxoconcha, *G.O., Sars.*																					
impressa. (*Baird*). 1850, Cythere impressa, Baird, Brit. Entom., p. 175. pl. xxi.	c	c	v c	c	r	c	v c	...	v c	v c	v c	v c	c	v c	r	v r	r	v c	v r	c	v c
guttata, (*Norman*). 1865. Cythere guttata, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. I., p. 19, pl. vi.	...	...	r	...	...	v r	...	...	c	...	...	v c	v r	c	v c	r	v r	v c	...	...	c
granulata, *G.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 64.	c	...	c	v r	...	r	...	...	v r	...	...	v c	...	...	...	...	...	...	...	...	v r
*cuneiformis, *n. sp., Brady. M.S.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	v r	v c	...	...
tamarindus, (*Jones*). 1856. Cytherideis tamarindus, Jones, Monog. Entom. Tert. Form. England, p. 49, pl. iii.	v c	v c	v c	v c	c	c	v c	...	c	c	...	v c	c	v c	c	v r	v r	v c	v c	v c	v c
pulchra, *B. R. and B.* 1870, Ann. and Mag. N.H., ser. 4, vol. VI., p. 23, pl. viii.	...	...	...	...		...	v r	...	...	...	..	...	...	...	...	...	v r	c	f	v r	...
multiflora. (*Norman*). 1864, Cythere multiflora, Norman, Brit Assoc. Report, p. 192.	c	v c	c	v c	v r	v c	v c	...	v c	r	v r	f	c	v r	...	...	...	v r	...	...	v c
Xestoleberis, *G.O., Sars.*																					
depressa. *G.O., Sars.* 1865, Overs Norg. mar. Ostra., p. 68.	v c	...	c	r	v r	f	c	...	v r	r	...	v r	v c	r	..	...	c	f	v r	...	v r
aurantia. (*Baird*). 1838, Cythere aurantia, Baird. Mag. Zool., Bot. II., 143, pl. v.	...	..	...	...	...	...	...	...	v r	v r	v r	v r	...	...	v r	..	...	v c	c	v r	v r
Cytherura, *G.O., Sars.*																					
nigrescens. (*Baird*). 1838, Cythere nigrescens, Baird, Mag. Zool., Bot. II., 143, pl. v.	v c	c	v c	c	v c	v c	v c	...	v r	c	...	c	c	r	v r	v c	v c	v r	c	c	
flavescens, *Brady.* 1869, Ann. and Mag. N.H., ser. 4, vol. III., p. 49, pl. viii.	v r	...	...	v r	...	v r	...	...	...	...	..	...	r	...	...	...	...	r	...	..	v c
pumila, *B C. and R.* 1874, Monog. Post. tert. Entom., Scotland, p. 198. pl. xi.	...	...	...	...	v r	v r	...	...	...	...	...	...	f	...	...	...	...	v r	c	...	...
undata, *G.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 75.	c	c	r	v c	...	c	f	...	c	r	v r	r	c	v r	r	v r	v r	v c	v r	r	v c
striata, *G.O., Sars.* 1865. Overs. Norg. mar. Ostra., p. 74.	v c	c	v c	...	...	f	c	...	r	v r	...	r	c	v c	...	v r	...	v c	v c	c	v c
cuneata., *Brady.* 1868, Monog. Rec. Brit. Ostra., p 442, pl. xxxii. 1874. Cytherura flavescens in part, Brady, Post. tert. Entom., Scotland. p. 198, pl. xvi.	r	r	r	v r	.	...	c	...	c	...	...	v c	c	v c	...	...	v c	v c	c	v c	v c
angulata, *Brady.* 1868, Monog. Rec Brit. Ostra., p. 440, pl. xxxiii.	v c	...	...	c	c	v c	v c	r	v c	v c	...	c	c	v r	...	...	...	v c	...	...	c
fulva, *B. and R.* 1874, Ann. and Mag. N.H., ser. 4, vol. XIII., p. 114, pl iv.	...	...	v r	...	..	v r	...	...	v r	...	...	...	v r	...	v r	...	..	r	...	v r	c
producta, *Brady.* 1868, Monog. Rec. Brit. Ostra., p. 448, pl. xxxiii.	v c	...	r	...	v r	v r	v c	v r	r	v r	...	f	c	...	...	..	...	...	...	..	v r
cornuta, *Brady.* 1868, Monog. Rec. Brit. Ostra., p. 445, pl. xxxii.	...	...	...	...	v r	..	...	...	...	...	...	...	...	...	...	...	...	v r	...	...	r
Robertsoni, *Brady.* 1868, Monog. Rec Brit. Ostra., p. 444, pl. xxxii.	...	...	v r	.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
gibba, (*Muller*). 1785. Cythere gibba, Muller, Entom., p. 24, pl. vii.	..	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	v r	v r	...	...
acuticosta, *G.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 76.	c	..	v r	v r	...	...	c	...	r	...	...	c	c	...	...	...	...	r	v c	...	v r
cellulosa, (*Norman*). 1865, Cythere cellulosa, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. I., p. 22, pl. v. & vi.	c	v c	c	c	r	r	c	..	r	r	...	c	v c	v c	r	c	...	v c	...	v c	c
clathrata, *G.O., Sars.* 1865, Overs. Norg mar. Ostra., p. 77	c	v r	v r	v c	r	c	c	v r	v r	...	...	r	...	v r	...	...	...	...	...	...	v r
propinqua, *B. and R.* 1870, Ann. and Mag. N.H , ser. 4, vol. VI., p. 24, pl. x.	...	..	...	c	...	...	...	...	...	..	...	...	...	...	...	...	...	r	...	..	...
Cytheropteron, *G.O., Sars.*																					
subcirvinatum, *G.O., Sars.* 1865. Overs. Norg mar. Ostra., p. 81.	...	...	...	..	...	...	v r	...	...	...	...	v r	v r	...	v r	...	...	f	f	v r	v r
latissimum, (*Norman*). 1865, Cythere latissima. Norman, Nat. Hist. Trans Northumberland and Durham, vol. I., p. 19, pl. vi.	c	...	v c	r	...	c	f	...	v c	...	...	c	r	v r	...	...	...	v r	...	...	r
nodosum, *Brady.* 1868, Monog. Rec. Brit. Ostra., p. 448, pl. xxxiv.	v c	v c	v c	c	v c	v c	v c	r	c	v c	v r	v r	v c	...	...	...	...	f	...	...	r
Moutrosiense, *B. C. and R.* 1874, Monog. Post. Tert. Entom., Scotland, p. 205, pl. viii. and xiv.	...	...	...	...	...	v r	...	...	...	...	...	...	...	...	...	...	...	...	v r	...	...
punctatum, *Brady.* 1868. Monog. Rec. Brit. Ostra., p. 449, pl. xxxiv.	v c	c	c	r	c	v c	v c	v r	v c	c	...	r	c	v r	...	v r	...	v r	...	...	...
angulatum, *B. and R.* 1872. Ann. and Mag. N.H., ser. 4, vol. VI., p. 62, pl. ii.	v r	v r	...	...	...	v r	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
rectum, (*Brady*). 1868, Monog. Rec. Brit. Ostra., p. 476.	...	...	...	...	...	...	...	...	...	...	...	...	v r	...	...	...	...	v r	...	...	...
Bythocythere, *G.O., Sars.*																					
simplex, (*Norman*). 1865, Cythere simplex, Nat. Hist. Trans. Northumberland and Durham, vol. I., p 17, pl. v.	...	...	...	...	...	...	...	...	r	...	...	v r	..	...	...	...	...	...	...	...	...
constricta. *G.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 65.	v c	...	c	v r	r	c	c	...	v c	v r	...	...	v r	...	...	...	...	...	...	...	v r
turgida, *G.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 84.	...	...	...	...	...	...	...	...	r	...	...	c	...	...	...	...	...	...	...	...	...
(?) *pavo, *n. sp., Brady M.S.*	...	...	...	r	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pseudocythere, *G.O., Sars.*																					
caudata, *G.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 88.	c	v r	...	r	v r	v r	v r	..	v r	c	...	r	v r	...	...	...	...	...	...	...	...
Cytherideis, *Jones.*																					
subulata, *Brady.* 1868, Monog. Rec. Brit. Ostra., p. 454, pl. xxxv.	v r	...	...	r	...	v r	v r	...	v r	v r	...	v r	v r	...	...	..	v r	c	v c	v c	v c
*foveolata, *Brady.* 1870, Ann. and Mag. N.H., ser. 4, vol. VI., p. 454, pl. xix.	r	...	v r	...	...	v r	v r	...	v r	v r	...	.	...	...	..	...	..	...	...	...	...
Sclerochilus, *G.O., Sars.*																					
contortus, (*Norman*). 1862, Cythere contortus, Norman, Ann. and Mag. N.H., vol. IX., p. 48, pl. ii.	v c	c	v c	c	v c	v c	v c	r	c	v c	..	v c	c	v c	...	...	...	f	v r	v r	r
Paradoxostoma, *Fischer.*																					
variabile, (*Baird*). 1835, Cythere variabilis, Baird, Trans. Berwickshire Nat. Club, vol. I., p. 98, pl. iii.	r	...	c	...	r	c	c	...	...	...	...	v r	c	...	...	r	v c	v c	..	v r	v r
abbreviatum, *G.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 94.	r	...	...	v r	...	...	...	...	v c	v c	v r	v c	r	...	...	...	...	c	...	v r	r
Normani, *Brady.* 1868, Monog. Rec. Brit. Ostra., p. 458, pl xxxv.	...	...	...	..	v r	...	v r	...	...	...	...	v r	...	...	...	..	...	v r	...	...	...
pulchellum, *G.O., Sars.* 1865, Overs. mar. Ostr., p. 95.	...	...	...	...	...	...	...	...	...	...	...	...	v r	..	...	...	...	v r	..	v r	...
obliquum, *G.O., Sars.* 1865. Overs Norg. mar. Ostra., p. 97.	...	...	...	...	v r	v r	...	...	...	v c	v r	...	...	...	...	...	...	v r	...	...	v r
hibernicum. *Brady.* 1868. Monog. Rec. Brit. Ostra., p. 460, pl. xxxv.	...	...	...	...	...	...	...	...	...	...	...	v r	...	...	...	...	...	v r	...	...	...
cuniforme. *Brady.* 1868, Monog. Rec. Brit. Ostra., p. 460, pl. xxxv.	c	...	v c	r	v c	c	c	...	v c	c	v r	v r	v c	r	v r	...	...	r	...	...	...
Fischeri, *G.O., Sars* 1866. Overs. Norg. mar Ostra., p. 96.	...	...	...	v r	...	v r	...	...	...	...	...	v r	...	...	...	...	...	f	...	...	...
flexuosum, *Brady.* 1866. Bythocythere (?) flexuosum. Brady, Brit. Asso. Report, p. 211.	v c	v r	c	v r	v c	v c	v c	r	c	r	...	v c	c	...	..	...	..	v r	...	v r	...
*truncatum, *n. sp.*	...	...	...	...	...	...	...	...	...	c	...	...	...	...	...	...	...	...	...	...	...
Xiphichilus,																					
tenuissima. (*Norman*). 1868. Bythocythere tenuissima. (Norman). Brit. Asso. Report. p. 247.	...	...	...	...	...	...	...	...	...	...	..	v c	...	...	r	...	...	...	...	...	...
SECTION MYDOCOPA. *SARS.*																					
FAMILY CYPRIDINIDÆ. *Baird.*																					
Philomedes, *Lilljeborg.*																					
interpuncta. (*Baird*). 1850. Cypridina interpuncta, *Baird*, Proc. Zool. Soc. London, pt. 18. p. 257. pl. xvii.	...	...	...	...	...	...	...	...	...	...	...	r	...	...	...	...	...	...	...	...	...
SECTION CLADOCOPA.																					
FAMILY POLYCOPIDÆ.																					
Polycope, *G.O., Sars.*																					
orbicularis, *G.O., Sars.* 1865, Overs. Norg. mar. Ostra., p. 122.	...	...	...	...	...	...	...	...	v r	...	...	v c	...	...	...	...	...	...	...	v r	...
SECTION PLATYCOPA.																					
FAMILY CYTHERELLIDÆ.																					
Cytherella, *Bosquet.*																					
scotica. *Brady.* 1866. Brit. Asso. Report, p. 211	...	...	v r	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1884-85.)

The Fungi of the North of Ireland.

PART I.

By HENRY WILLIAM LETT, M.A., Trin. Coll., Dublin

The earliest writers who mention any of the Fungi of the North of Ireland appear to be the editors of "The Antient and Present State of the County of Down: Dublin, 1744." This book is now generally known as Harris's County Down, from a Mr. Walter Harris having had the principal share in its compilation. And the next is, Dr. Taylor, of County Cork, who wrote nearly half a century ago.

Harris's Down gives "A catalogue of the more rare Plants found spontaneously growing in the County of Down in May, 1743, by an expert Botanist employed for that purpose, and examined in Dublin by some well skilled in that branch of knowledge." These plants number exactly forty, and four are Fungi, which are described at p. 183 as follows.

"28. Fungus Arboreus acetabuli modo cavus, coccineus, marginibus pilosis, *Raii Syn.* Fungoides coccineum oris pilosis, acetabuli forma. *Tournf. Inst.* It grows on rotten oaks in Kilwarlin near Hillsborough in June." There can be no doubt this is *Peziza coccinea* (Jacq).

"29. Fungus Pileatus major supernè coloris Castanei, lamellis Candidis, caule maculato. *Raii Syn.—Chesnut-coloured Mushroom with white Gills and spotted Stalk.* Dr. *Sherard* found this in the County of Down, but has omitted to mention the particular place where."

"30. Fungus pulverulentus, Crepitus Lupi dictus major pediculo longiori ventricoso. *Raii Hist.—Dusty Mushroom the greater*, with a long, tumid foot stalk, found at *Moyra* and other parts." This and the next are evidently Puffballs.

"31. Fungus pulverulentus, Crepitus Lupi dictus, pediculo longiori scabro. Dr. *Sherard. Dusty Mushroom* with a long rough foot stalk, found at *Waringstown.*"

The Dr. Sherard whose name occurs twice in connection with these four plants may be regarded as the first Ulster fungologist. Perhaps some more of his observations may be unearthed by future researches.

The next worker in this department of the Botany of the district was Templeton, who carried on the collection and study of the Fungi found near Belfast more than eighty years ago, with the result of whose efforts the authors of the "B.N.F.C. Guide to Belfast, &c.," were unacquainted. Those efforts are embodied in a paper in the *Annals of Natural History, Vol. V., pp.* 3-6, 1840, the title of which is—"Catalogue of the Species of Fungi obtained in the North of Ireland by John Templeton, Esq., of Cranmore, Belfast," by "Thomas Taylor, M D., M.R.I.A., F.L.S." And to the list is the following preface:—"Dunkerron, Kenmare, 12th March, 1839.—The following Catalogue of Fungi, collected by the late Mr. John Templeton in the vicinity of Belfast, is drawn up from drawings and specimens left by him, and which Mrs. Templeton placed in my hands, with a desire that I should carefully ascertain the species and their modern names, with a view to publication. I have bestowed upon them my best attention, and yet the list is deficient by a few of the drawings whose counterparts I have not yet met with in nature, and by a very few of the specimens, from whose imperfect state no satisfactory conclusions could be drawn. Still, I cannot but admire the industry and talents of one who, at least equally successful in all the other departments of zoology and botany, displayed so intimate a knowledge of plants difficult of investigation, at least before the termination of the last century, when the greater part of this collection was already made.—THOMAS TAYLOR."

The 226 Species collected by Templeton are inserted in the following Catalogue, which, for convenience of reference, is arranged according to M. C. Cooke's, *Handbook of British Fungi, pp.* 901 (London, 1871), whose descriptions are referred to, except where otherwise stated. As I have adopted the classification used in that work, I have not thought it advisable to give the titles of the Families and Orders as they occur.

Two forms of *Sclerotium* (*complanatum*, Tode. and *durum*, Pera) collected by Templeton have been omitted, as they are regarded by modern mycologists as immature states. Wherever necessary the Synonyms employed by Taylor have been added.

There are six of Templeton's species which, owing to being unable to consult any of the older writers on British Fungi, I cannot trace to their modern Synonyms, and therefore, for the present, enumerate them here. These are:—

Thelephora aurantiaca,	Sow.
Peziza aquatica,	De Cand.
Peziza lycoperdioides,	De Cand.
Tremella difformis,	With.
Sphœria rimosa,	Sow.
Demantium ciliare,	Pers.

It may here be inquired, what has become of Templeton's drawings and specimens, and would it be possible to have them placed in the Herbarium of the Museum of Belfast, near the scenes of his varied and many labours for science, and the town close to which he had his home, and with which his name will be always associated? The Belfast Museum already possesses, through the generosity of Mr. Robert M. Young, a small collection of cryptogamic plants made by Templeton between the years 1801-1809, which contains a few specimens of Fungi, but, as they are not marked with any localities, I regret my inability to recognise them as Irish.

However, a more interesting and important discovery has been lately made by Mr. S. A. Stewart, F.B.S.E., who has found amongst Mr. W. Thompson's papers on the Museum shelves, a number of Fungi collected by that genius of varied talents, some of which I was glad to find were natives of the North, and will be found duly recorded in my list.

It would seem that nothing has been done since Mr. Templeton's time to study the Fungi of our district, except the few species brought together by the author of the Natural History of Ireland. But recently attention has been given to the subject by several students of nature, whose specimens I have had the pleasure of inspecting, and a certain public interest has been excited about "Toad stools," as was evidenced by the attendances at the Fungus Forays of 1883, to Shane's Castle, County Antrim; of 1884, to Killymoon, near Cookstown, County Tyrone; and of 1885, to Rademon, near Crossgar, County Down. The work effected by the B.N.F.C. on those occasions can be estimated from the frequent mention of those localities in the accompanying pages.

The present list contains 582 species, and is intended as the beginning of a Catalogue which, it is expected, will be continued from time to time. It embraces only a small portion of the Fungi of the North of Ireland, and these from merely a few localities, a large number of the most common species not being recorded in it, a deficiency which time and patience can, and doubtless will, supply. There remain in my possession many specimens and drawings of undecided forms, which I have not been able to clear off in time for this report.

In the identification of species, much assistance has been afforded me by W. B. Grove, Esq., B.A., of Manchester, and Greenwood Pim, Esq., M.A., F.L.S., of Monkstown, County Dublin, who have taken a great deal of trouble with many difficulties that I submitted to their judgment. Mr. Pim, who has been working for some years on the Fungi of Leinster and Munster, added to his favours by spending two pleasant days with me in September, 1885, when we had the satisfaction of verifying more than 80 species among the woods of Donard Demesne, and Tollymore Park. I hope that the other kind friends who have contributed specimens will continue and extend their observations till the records are completed for all the counties in Ulster.

NOTE.—The plants included in this Part which I did not collect—except Templeton's in Taylor's list—have been all examined by me, and in nearly every instance in a living state.—H. W. L.

1. Agaricus (Amanita) vaginatus. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rosstrevor and Narrow Water Woods, County Down, 1883; Killymoon, County Tyrone, 1884; and Rademon, County Down, 1885.—H. W. L.

2. Agaricus (Amanita) ceciliæ. *B. and Br.*

Narrow Water Wood, Co. Down, 1883. Rare.—H. W. L.

3. Agaricus (Amanita) adnatus. *Smith.*

Ardmore Glebe, Co. Armagh, 1884. Very rare.—H. W. L.

4. Agaricus (Amanita) phalloides. *Fr.*

Near Belfast, Templeton (*Agaricus bulbosus, Sow.*). Ann. Nat. Hist., Vol. V. Narrow Water Wood, Co. Down, 1883; and Killymoon, Co. Tyrone, 1884.—H. W. L.

5. Agaricus (Amanita) mappa. *Batsch.*

Several under trees near the grotto in Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

6. Agaricus (Amanita) muscarius. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Shane's Castle Park, Co. Antrim; Wood at the Ferry Hill, near Omeath, Co. Louth, and Raughlan, Co. Armagh, 1883; Donard Demesne, Rademon, and Tollymore Park, County Down, 1885. Abundant in fir and birch woods.—H. W. L.

7. Agaricus (Amanita) pantherinus. *D.C.*

Donard Demesne, Co. Down, 1884. Rare.—H. W. L.

8. Agaricus (Amanita) rubescens. *P.*

Warrenpoint, County Down, 1883; Killymoon, Co. Tyrone, 1884; Donard Demesne, and Tollymore Park, Co. Down, 1885. Abundant in both woods.—H. W. L.

9. Agaricus (Lepiota) procerus. *Scop.*

Ardmore Glebe, Co. Armagh, and sandhills at Newcastle, County Down, abundant, 1884; Rademon, Co. Down, 1885.—H. W. L.

10. Agaricus (Lepiota) rachodes. *Vitt.*

In a plantation at Raughlan, Co. Armagh, 1883.—H. W. L.

11. Agaricus (Lepiota) gracilentus. *Krombh.*

Abundant among the sandhills at Newcastle, Co. Down, 1884.—H.W.L.

12. Agaricus (Lepiota) clypeolarius. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist. Vol. V.

13. Agaricus (Lepiota) cristatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. In the lawn near the Castle of Killymoon, Co. Tyrone, 1884.—H. W. L.

14. Agaricus (Lepiota) granulosus. *Batsch.*

I have collected this pretty species on the summit of Slieve Donard, which rises to a height of 2,796 feet, and among the sandhills near Newcastle, Co. Down, where it was abundant in the short grass only a few feet above the sea level, 1883. Tollymore Park, Co. Down, 1885.—H. W. L.

15. Agaricus (Lepiota) granulosus *var.* **carcharias.** *Pers.*

In a plantation near Holywood, Co. Down, 1883—R. L. Praeger; top of Knockbarragh Hill, Co. Down, 1883.—H. W. L.

16. Agaricus (Armillaria) melleus. *Vahl.*

Shane's Castle, Co. Antrim, and Ardmore Glebe, Co. Armagh, 1883; Rademon, Tollymore Park, and Donard Demesne, Co. Down, 1885. Most abundant in late autumn.—H. W. L.

17. Agaricus (Armillaria) mucidus. *Fr.*

Lurgan Demesne, Co. Armagh, and Killymoon, Co. Tyrone, 1884.—H.W.L.

18. Agaricus (Tricholoma) flavo brunneus. *Fr.*

Maralin, Co. Down, 1884.—C. H. Waddell.

19. Agaricus (Tricholoma) albo brunneus. *P.*

Ardmore Glebe, County Armagh, 1882; Donard Lodge, County Down 1885.—H. W. L.

20. Agaricus (Tricholoma) rutilans. *Schœff.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Wood at the Ferry Hill, near Omeath, Co. Louth, 1883; Donard Demesne, and Tollymore Park, Co. Down, 1884.—H. W. L.

21. Agaricus (Tricholoma) sculptaturus. *Fr.*

Wood at the Ferry Hill, near Omeath, Co. Louth, 1883.—H. W. L.

22. Agaricus (Tricholoma) columbetta. *Fr.*

Killymoon, County Tyrone, 1884.—H. W. L.

23. Agaricus (Tricholoma) imbricatus. *Fr.*

In fir plantation, Donard Demesne, Co. Down, 1884.—H. W. L.

24. Agaricus (Tricholoma) terreus. *Schœff.*

Killymoon, Co. Tyrone, 1884.—H. W. L.

25. Agaricus (Tricholoma) colossus. *Fr.*

A single specimen, in fine condition, under trees at rere of Warrenpoint Church, Co. Down, 1883.—H. W. L.

26. Agaricus (Tricholoma) gambosus. *Fr.*

Islandmagee, Co. Antrim, and Ardmore and Derrytrasna, Co. Armagh, 1884. This is very abundant and large every year in the latter localities.—H. W. L.

27. Agaricus (Tricholoma) albus. *Fr.*

Rosstrevor Wood, 1883, and Donard Demesne, 1884, Co. Down.—H. W. L.

28. Agaricus (Tricholoma) grammopodius. *Bull.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

29. Agaricus (Tricholoma) militaris. *Lasch.*

A single specimen, in fine condition, at Rademon, County Down, 1885.—H. W. L.

30. Agaricus (Tricholoma) nudus. *Fr.*

Raughlan, County Armagh, 1883.—H. W. L.

31. Agaricus (Clitocybe) nebularis. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. In abundant clusters and rings in Shane's Castle Park, Co. Antrim, 1885. Scarce in Tollymore Park, Co. Down, 1885.—H. W. L. In a very perfect ring, seven yards across, the plants so thick as to be riding on each other, at Glenmore, near Lisburn, Co. Antrim, 1885.—J. H. Davies. I went to see this.—H. W. L.

32. Agaricus (Clitocybe) odorus. *Bull.*

Donard Demesne, and Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

33. Agaricus (Clitocybe) cerussatus. *Fr.*

In a fir wood in Tollymore Park, 1884, and Donard Demesne, 1885, Co. Down.—H. W. L.

34. Agaricus (Clitocybe) dealbatus. *P.*

Killymoon, Co. Tyrone, 1884.—H. W. L.

35. Agaricus (Clitocybe) elixus. *Sow.*

Ardmore Glebe, Co. Armagh, 1882.—H. W. L.

36. Agaricus (Clitocybe) fumosus. *P.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

37. Agaricus (Clitocybe) giganteus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

38. Agaricus (Clitocybe) maximus. *Fr.*

Near the Vicarage, Warrenpoint, Co. Down, 1883.—H. W. L.

39. Agaricus (Clitocybe) geotrupus. *Bull.*

Near the Saw-mill in Tollymore Park, Co. Down, 1884.—H. W. L.

40. Agaricus (Clitocybe) inversus. *Scop.*

Under Scotch firs at Raughlan, Co. Armagh, 1884.—H. W. L.

41. Agaricus (Clitocybe) gilvus. *Pers.*

This species is described in Grevillea, No. 65, p. 55, of the new issue of Cooke's White-spored Hymenocetes. Rademon, Co. Down, 1885.—H. W. L.

42. Agaricus (Clitocybe) flaccidus, *var.* **lobatus.** *Sow.*

Derryadd, near Lurgan, Co. Armagh, 1884.—H. W. L.

43. Agaricus (Clitocybe) cyathiformis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.; Donard Demesne, Co. Down, 1885.—H. W. L.

44. Agaricus (Clitocybe) brumalis. *Fr.*

Roadside, in several places, Derrytrasna, Co. Armagh, 1884.—H. W. L.

45. Agaricus (Clitocybe) fragrans. *Sow.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.; Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

46. Agaricus (Clitocybe) ectypus. *Fr.*

Donard Demesne and Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

47. Agaricus (Clitocybe) bellus. *Fr.*

Near Ardmore School, Co. Armagh, 1885.—H. W. L.

48. Agaricus (Clitocybe) laccatus. *Scop.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.; Narrow Water Demesne and Donard Demesne, Co. Down, and Shane's Castle Demesne, Co. Antrim, 1883; Killymoon, Co. Tyrone, 1884; Rademon, County Down, 1885. —H. W. L.

49. Agaricus (Clitocybe) laccatus *var.* **amethystinus.** *Bot.*

In a wood at the Ferry Hill, near Omeath, Co. Louth, and Shane's Castle Demesne, Co. Antrim, 1883. Not common.—H. W. L.

50. Agaricus (Clitocybe) gilvus. *Pers.*

Rademon, Co. Down, 1885.—H. W. L.

51. Agaricus (Pleurotus) corticatus. *Fr.*

Several on decaying "sleepers" of the railway near the sandhills, at Newcastle, Co. Down, 1885. I gathered these on the Excursion of the B.N.F.C. in July to the Mourne Mountains.—H. W. L.

52. Agaricus (Pleurotus) dryinus. *P.*

A few specimens on an aged elm tree, Ardmore Glebe, County Armagh, 1884.—H. W. L.

53. Agaricus (Pleurotus) ulmarius. *Bull.*

A few specimens on a decaying elm, Ardmore Glebe, Co. Armagh, 1884. —H. W. L.

54. Agaricus (Pleurotus) salignus. *Fr.*

Abundant on a dead poplar tree, Derryadd, near Lurgan, Co. Armagh, 1882. This appeared for several years on the same trunk. I have not found it elsewhere.—H. W. L.

55. Agaricus (Pleurotus) acerosus. *Fr.*

On the shady side of a clay bank in Ardmore Glebe garden, Co. Armagh, 1885. —H. W. L,

56. Agaricus (Pleurotus) applicatus. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.; Killymoon, County Tyrone, 1884.—H. W. L.

57. Agaricus (Collybia) radicatus. *Relh.*

In a wood at the Ferry Hill, near Omeath, County Louth, and Lurgan Demesne, Co. Armagh, 1883; Tollymore Park, and Donard Demesne, Co. Down, 1884.—H. W. L.

58. Agaricus (Collybia) maculatus. *A. and S.*

Shore of Lough Neagh, at Derryadd, near Lurgan, Co. Armagh, 1883. Very rare.—H. W. L.

59. Agaricus (Collybia) butyraceus. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist, Vol. V. Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L,

60. Agaricus (Collybia) velutipes. *Curt.*

On elm, poplar, &c., when felled, Co. Armagh, 1882; Co. Down, 1884; Co. Antrim, 1885. Very common and abundant.—H. W. L.

61. Agaricus (Collybia) caulicinalis. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh, 1883.—H. W. L.

62, Agaricus (Collybia) confluens. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Killymoon, County Tyrone, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

63. Agaricus (Collybia) dryophilus. *Bull.*

Wood at the Ferry Hill, near Omeath, Co. Louth, 1883; Killymoon, Co. Tyrone, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

64. Agaricus (Collybia) clavus. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

65. Agaricus (Mycena) pelianthinus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

66. Agaricus (Mycena) elegans. *P.*

Killymoon, County Tyrone, 1884.—H. W. L.

67. Agaricus (Mycena) purus. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Donard Demesne, County Down, 1885.—G. Pim, and H. W. L.

68, Agaricus (Mycena) lacteus. *P.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

69. Agaricus (Mycena) galericulatus. *Scop.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rademon, Co. Down, 1885.—H. W. L.

70. Agaricus (Mycena) alcalinus. *Fr.*
Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

71. Agaricus (Mycena) tenellus. *Schum.*
Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

72. Agaricus (Mycena) cruentus. *Fr.*
Shane's Castle Demesne, Co. Antrim, 1883.—H. W. L.

73. Agaricus (Mycena) epipterygius. *Scop.*
Donard Demesne, Tollymore Park, and Rademon, County Down, 1885.—H. W. L.

74. Agaricus (Mycena) pelliculosus. *Fr.*
Bog at Raughlan, Co. Armagh, 1883.—H. W. L.

75. Agaricus (Mycena) roridus. *Fr.*
On dead bramble stem, Ardmore Glebe, Co. Armagh, and Rademon, Co. Down, 1885.—H. W. L.

76. Agaricus (Mycena) stylobates. *P.*
Abundant in Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

77. Agaricus (Mycena) corticola. *Schum.*
Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. On old elm trees, Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

78. Agaricus (Mycena) cohœrens. *P.*
For the description of this species, see Fries's Epic., 2nd ed., 1874, p. 137; also Grevillea, Vol. I., p. 174. Near Belfast, Templeton, Ann. Nat. Hist. Vol. V.

79. Agaricus (Omphalia) pyxidatus. *Bull.*
In short grass, Killymoon, County Tyrone, 1884.—H. W. L.

80. Agaricus (Omphalia) umbelliferus. *L.*
Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Common in County Armagh, and among the Mourne Mountains, Co. Down. Near top of Slieve Donard, Co. Down, 1883; top of Shan Slieve, Co. Down, 1885.—H. W. L.

81. Agaricus (Omphalia) stellatus. *Sow.*
Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

82. Agaricus (Omphalia) griseus. *Fr.*
Donard Demesne, and Rademon, Co. Down, 1885.—H. W. L.

83. Agaricus (Omphalia) fibula. *Bull.*

Narrow Water Demesne, Co. Down, 1883.—H. W. L.

84. Agaricus (Volvaria) bombycinus. *Schœff.*

I found one specimen, in perfect condition, on a fallen, decayed branch, in Killymoon Demesne, Co. Tyrone, 1884.—H. W. L.

85. Agaricus (Volvaria) speciosus. *Fr.*

A few were growing by the side of the road in Killymoon Demesne, Co. Tyrone, B.N.F.C. Excursion, 1884.—H. W. L.

86. Agaricus (Pluteus) cervinus. *Schœff.*

On the dead stump of a willow tree at Ardmore Glebe, County Armagh, 1884.—H. W. L

87. Agaricus (Entoloma) helodes. *Fr.*

On peaty soil, Ardmore Glebe, County Armagh, and Donard Demesne, Co. Down, 1884.—H. W. L.

88. Agaricus (Entoloma) ameides. *B. and Br.*

What Fries calls the "odor peculiaris" of this plant seems to me to resemble the smell of phosphorus or damp matches. Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

89. Agaricus (Entoloma) jubatus. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

90. Agaricus (Entoloma) clypeatus. *L.*

Near Belfast, Templeton (*Entoloma fertilis*), Ann. Nat. Hist., Vol. V.

91. Agaricus (Entoloma) rhodopolius. *Fr.*

Donard Demesne and Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

92. Agaricus (Entoloma) sinuatus. *Fr.*

Near Belfast, Templeton (*Agaricus, Entoloma fertilis, Pers.*), Ann. Nat. Hist., Vol. V.

93. Agaricus (Entoloma) sericeus. *Bull.*

Narrow Water Demesne, Co. Down, and Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

94. Agaricus (Entoloma) nidorosus. *Fr.*

Donard Demesne, and Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

95. Agaricus (Clitopilus) prunulus. *Scop.*

Shane's Castle Demesne, Co. Antrim, 1883.—H. W. L.

96. Agaricus (Claudopus) variabilis. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Maralin, Co. Down, 1884.—C. H. Waddell.

97. Agaricus (Leptonia) chalybæus. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

98. Agaricus (Nolanea) pascuus. *P.*

Near Belfast, Templeton, Ann Nat. Hist., Vol. V.

99. Agaricus (Nolanea) rufo-carneus. *Berk.*

Among heather in a bog at Derryadd, near Lurgan, Co. Armagh, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

100. Agaricus (Pholiota) squarrosus. *Müll.*

Near Belfast, Templeton, Ann Nat. Hist., Vol. V. Holywood, Co. Down, 1883—R. L. Praeger. Ardmore, County Armagh, 1883; Tollymore Park, Co. Down, 1885.—H. W. L.

101. Agaricus (Pholiota) spectabilis. *Fr.*

Near Belfast, Templeton (*A. aureus, Bull*), Ann. Nat. Hist., Vol. V. On a felled apple tree, Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

102. Agaricus (Pholiota) aureus. *Bull.*

A plant so named occurs in Dr. Taylor's List of Templeton's Fungi, and may for convenience be placed here. Fries, in his Epicrisis, 2nd edition 1874, p. 317, says of it—"Qui fons nominis *A. aurei* plane diversa tam a nostro *A. aureo* quam *A. spectabili*, lamellis angustis albis mox distinctus, sed affinitatis dubiæ."

103. Agaricus (Pholiota) junonius. *Fr.*

In a decaying willow at Raughlan, Co. Armagh, 1884.—H. W. L.

104. Agaricus (Pholiota) mutabilis. *Schœff.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

105. Agaricus (Hebeloma) sinapizans. *Fr.*

Killymoon, Co. Tyrone, 1884; Rademon, Co. Down, 1885.—H. W. L.

106. Agaricus (Hebeloma) crustuliniformis. *Bull.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

107. Agaricus (Hebeloma) fastibilis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh, 1884,—H. W. L.

108. Agaricus (Hebeloma) flocculentus. *Poll.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

109. Agaricus (Hebeloma) plumosus. *Bolt.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

110. Agaricus (Hebeloma) scaber. *Müll.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

111. Agaricus (Hebeloma) fibrosus. *Sow.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

112. Agaricus (Hebeloma) rimosus. *Bull.*

On summits of the Sallagh Braes, Co. Antrim, and Killymoon, County Tyrone, 1884.—H. W. L.

113. Agaricus (Hebeloma) geophyllus. *Sow.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Donard Demesne, and Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

114. Agaricus (Hebeloma) calamistratus. *Fr.*

In shady grass by the side of a path in Donard Demesne, Co. Down, 1884.—H. W. L. (See Fries, Epic., 2nd edition, 1874, p. 227.)

115. Agaricus (Flammula) flavidus. *Schœff.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

116. Agaricus (Flammula) sapineus. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L

117. Agaricus (Crepidotus) mollis. *Schœff.*

On decaying wood in Rosstrevor Wood, 1883, and Tollymore Park, Co. Down, 1884.—H. W. L.

118. Agaricus (Naucoria) escharoides. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

119. Agaricus (Galera) tener. *Schœff.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Abundant in dungy

spots among grass on Lough Neagh shore, at Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

120. Agaricus (Galera) hypnorum. *Batsch.*

In a bog near the Bannfoot, Co. Armagh, 1884; Donard Demesne, and Tollymore Park, Co. Down, 1885.—H. W. L.

121. Agaricus (Galera) sphagnorum. *Pers.*

Anglesey Mountain, near Omeath, Co. Louth, 1883; Derryinver Bog, Co. Armagh, 1884.—H. W. L.

122. Agaricus (Psalliota) arvensis. *Schœff.*

Near Belfast, Templeton (*A. Georgii*), Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1882; Tollymore Park, Co. Down, 1885.—H. W. L.

123. Agaricus (Psalliota) arvensis *var.* **villaticus.** *Brand.*

Raughlan, and Derryadd, Co. Armagh, 1883.—H. W. L. A specimen weighing 7½ oz., and measuring 8 in. high and 10 in. in diameter, was sent to me by S. A. Stewart, from a wood by the river near Downpatrick, 19th August, 1885. (See Fries, Epic., 2nd edition, p. 280.)

124. Agaricus (Psalliota) campestris. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. The Common Meadow Mushroom is common, and in some cases abundant, all through the North of Ireland.—H. W. L.

var. pratensis. *Vitt.*

Raughlan, Co. Armagh, 1885.—H. W. L.

var. silvicola. *Vitt.*

Derryadd, near Lurgan, Co. Armagh, 1885.—H. W. L.

125. Agaricus (Stropharia) æruginosus. *Curt.*

Killymoon, Co. Tyrone, Massereene Park, Co. Antrim, 1884; Ardmore Glebe, Co. Armagh, Donard Demesne, and Tollymore Park, Co. Down, 1885. —H. W. L.

126. Agaricus (Stropharia) semiglobatus. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh, 1883; Rademon, Co. Down, 1885.—H. W. L.

127. Agaricus (Hypholoma) sublateritius. *Fr.*

Abundant on an old stump near the entrance to Killymoon Demesne from Cookstown, Co. Tyrone, 1884.—H. W. L.

128. Agaricus (Hypholoma) epixanthus. *Fr.*

In a wood at the Ferry Hill, near Omeath, Co. Louth, 1883.—H. W. L.

129. Agaricus (Hypholoma) fascicularis. *Hud.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Common and abundant everywhere. Ardmore, Co. Armagh, Maralin, Donard Demesne, Tollymore Park, and Rademon, Co. Down, 1885.—H. W. L.

130, Agaricus (Hypholoma) fascicularis *var.* **robustior.** *Pers.*

Ardmore, Co. Armagh, 1885.—H. W. L. (See Fries, Epic., 2nd ed., p. 292.)

131. Agaricus (Hypholoma) lacrymabundus. *Fr.*

Rademon, Co. Down, 1885.—H. W. L.

132. Agaricus (Hypholoma) appendiculatus. *Bull.*

Ardmore Glebe, Co. Armagh, 1884; Rademon, Co. Down, 1885.—H. W. L.

133. Agaricus (Psilocybe) fœnisecii. *P.*

Raughlan, 1884, and Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

134. Agaricus (Panæolus) separatus. *L.*

Near Belfast, Templeton (*Ag. semiovatus*), Ann. Nat. Hist., Vol. V. Shore of Lough Neagh, at Derryadd, near Lurgan, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884; Slieve Donard, Co. Down, 1885.—H. W. L.

135. Agaricus (Panæolus) fimiputris. *Bull.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

136. Agaricus (Psathyrella) hiascens. *Fr.*

In the garden at Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

137. Agaricus (Psathyrella) disseminatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Warrenpoint, County Down, 1883.—H. W. L.

138. Coprinus comatus. *Fr.*

Ardmore, and Raughlan, Co. Armagh, 1883; Drumcro, and Rosstrevor, Co. Down, Cookstown, Co. Tyrone, 1884.—H. W. L.

139. Coprinus ovatus. *Fr.*

Killymoon, Co. Tyrone, 1884.—H W. L.

140. Coprinus atramentarius. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Derryadd, County Armagh, 1883; Rademon, Co. Down, 1885.—H. W. L.

141. Coprinus fuscesens. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

142. Coprinus picaceus. *Fr.*

Derryadd, near Lurgan, 1882, and Ardmore Glebe, Co. Armagh, 1885. Very rare.—H. W. L.

143. Coprinus niveus. *Fr.*

Derrymacash, Co. Armagh, 1885. Rare.—H. W. L.

144. Coprinus micaceus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh; Killymoon, Co. Tyrone, 1884; Rademon, and Donard Lodge, Co. Down, 1885.—H. W. L.

145. Coprinus plicatilis. *Fr.*

Ardmore Glebe, Co. Armagh, Killymoon, Co. Tyrone, Donard Lodge, Co. Down, 1884.—H. W. L.

146. Coprinus hemerobius. *Fr.*

Narrow Water Demesne, Co. Down, in old pasture, 1883. Very rare.—H. W. L.

147. Bolbitius boltoni. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

148. Bolbitius fragilis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

149. Bolbitius tener. *B.*

Abundant in grass on Rosstrevor Mountain, Co. Down, from 900 feet 1500 feet, 1883.—H. W. L.

150. Cortinarius (Phlegmacium) caperatus. *Fr.*

Shane's Castle Park, Co. Antrim, 1883.—H. W. L.

151. Cortinarius (Phlegmacium) varius. *Fr.*

Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

152. Cortinarius (Phlegmacium) cyanipes. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

153. Cortinarius (Phlegmacium) purpurascens. *Fr.*

Ardmore Glebe, Co. Armagh, and Donard Demesne, Co. Down, 1885.—H. W. L.

154. Cortinarius (Phlegmacium) scaurus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

155. Cortinarius (Myxacium) collinitus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

156. Cortinarius (Inoloma) callisteus. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

157. Cortinarius (Inoloma) bulliardi. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

158. Cortinarius (Inoloma) sublanatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

159. Cortinarius (Dermocybe) anomalus. *Fr.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

160. Cortinarius (Dermocybe) cinnamoneus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Donard Demesne, and Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

161. Cortinarius (Telamonia) evernius. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

162. Cortinarius (Telamonia) gentilis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

163. Cortinarius (Hygrocybe) dilutus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

164. Cortinarius (Hygrocybe) acutus. *Fr.*

Bank of the Lagan, near Belfast, Co. Antrim, B.N.F.C. Excursion, July, 1884.—J. J. Andrew, and H. W. L.

165. Lepista personata. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, and in plantation at Glenmore, near Lisburn, Co. Antrim, 1885.—H. W. L.

166. Paxillus involutus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Raughlan, and Ardmore Glebe, Co. Armagh, and Killymoon, Co. Tyrone, 1884; Rademon, and Donard Demesne, Co. Down, 1885.—H. W. L.

167. Hygrophorus eburneus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1885.—H. W. L.

168. Hygrophorus pratensis. *Fr.*

Near the Ross Monument at Rosstrevor, and in Tollymore Park, Co. Down, 1885.—H. W. L.

169. Hygrophorus virgineus. *Fr.*

Goragh Wood, Co. Armagh, 1883. Abundant in short grass about Newcastle, Co. Down, 1884.—H. W. L.

170. Hygrophorus niveus. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

171. Hygrophorus ovinus. *Fr.*

Near Belfast, Templeton (*H. compressus, Sow.*), Ann. Nat. Hist., Vol. V.

172. Hygrophorus ceraceus. *Fr.*

Rosstrevor, 1883, and Donard Demesne, 1884, Co. Down.—H. W. L.

173. Hygrophorus coccineus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Among the sandhills at Newcastle, and Donard Demesne, Co. Down, 1885.—H. W. L.

174. Hygrophorus miniatus. *Fr.*

In grass at 1100 feet on Rosstrevor Mountain, Co. Down, 1883; at 2204 feet on Shan Slieve, Co. Down, 1885.—H. W. L.

175. Hygrophorus puniceus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist. Vol. V.

176. Hygrophorus obrusseus. *Fr.*

Rosstrevor Wood, Co. Down, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

177. Hygrophorus conicus. *Fr.*

Ardmore, County Armagh, Killymoon, Co. Tyrone, and sandhills near Newcastle, Co. Down, 1884.—H. W. L.

178. Hygrophorus chlorophanus. *Fr.*

Clonallon, Co. Down, 1883; Killymoon, Co. Tyrone, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

179. Hygrophorus psittacinus. *Fr.*

Shane's Castle Park, Co. Antrim, 1883; Donard Demesne, County Down, 1885.—H. W. L.

180. Gomphidius glutinosus. *Fr.*

Raughlan, Co. Armagh, 1883. Abundant.—H. W. L.

181. Gomphidius viscidus. *Fr.*

Killymoon, Co. Tyrone, and Maralin, Co. Down, 1883.—C. H. Waddell. Raughlan, Co. Armagh, 1884.—H. W. L.

182. Lactarius torminosus. *Fr.*

Shane's Castle Park, Co. Antrim, 1883; Tollymore Park, County Down 1885.—H. W. L.

183. Lactarius cilicioides. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

184. Lactarius turpis. *Fr.*

Ardmore Glebe, Co. Armagh, 1884; Rademon, County Down, 1885.—H. W. L.

185. Lactarius controversus. *Pers.*

Ardmore Glebe, Co. Armagh, under trees in old pasturage, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

186. Lactarius zonarius. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1885.—H. W. L.

187. Lactarius blennius. *Fr.*

Narrow Water Demesne, Co. Down, and a wood at the Ferry Hill, near Omeath, Co. Louth, 1883; Tollymore Park, Co. Down, 1885.—H. W. L.

188. Lactarius hysginus. *Fr.*

Rademon, Co. Down, 1885.—H. W. L.

189. Lactarius piperatus. *Fr.*

Ardmore Glebe, County Armagh, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

190. Lactarius vellereus. *Fr.*

Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

191. Lactarius deliciosus. *Fr.*

Knockbarragh Hill, Co. Down, 1883; Killymoon, County Tyrone, and Raughlan, Co. Armagh, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

192. Lactarius pallidus. *Fr.*

Killymoon, Co. Tyrone, and Raughlan, Co. Armagh, very large, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

193. Lactarius quietus. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

194. Lactarius theiogalus. *Fr.*

Knockbarragh Hill, Co. Down, 1883.—H. W. L.

195. Lactarius rufus. *Fr.*

Killymoon, County Tyrone, and Raughlan, Co. Armagh, 1884; Donard Demesne, County Down, 1885.—H. W. L.

196. Lactarius glyciosmus. *Fr.*

Raughlan, Co. Armagh, under Scotch firs, 1884.—H. W. L.

197. Lactarius serifluus. *Fr.*

Ardmore Glebe, Co. Armagh, 1882; Shane's Castle Park, Co. Antrim, 1883; Killymoon, Co. Tyrone, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

198. Lactarius volemum. *Fr.*

Ardmore Glebe, Co. Armagh, abundant, 1883; Rademon, Co. Down, 1885.—H. W. L.

199. Lactarius mitissimus. *Fr.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

200. Lactarius subdulcis. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, County Tyrone, 1884.—H. W. L.

201. Lactarius pargamenus. *Sow.*

(For description see Fries, Epic., 2nd edition, 1874, p. 430.) Narrow Water Demesne, Co. Down, 1883.—H. W. L.

202. Russula nigricans. *Fr.*

Killymoon, Co. Tyrone, 1884; Rademon, and Tollymore Park, County Down, 1885. Not common.—H. W. L.

203. Russula adusta. *Fr.*

Rademon, Co. Down, 1885.—H. W. L.

204. Russula drimeia. *Cooke.*

Raughlan, Co. Armagh, 1884.—H. W. L.

205. Russula virescens. *Fr.*

Rosstrevor Wood, County Down, abundant, 1883; Tollymore Park, Co. Down, 1885.—H. W. L.

206. Russula rubra. *Fr.*

Raughlan Island, Co. Armagh, abundant, 1883; Killymoon, Co. Tyrone, 1884; Rademon, Co. Down, 1885.—H. W. L.

207. Russula heterophylla. *Fr.*

Killymoon, Co. Tyrone, 1884.—H. W. L.

208. Russula emetica. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Raughlan, County Armagh, 1883; Killymoon, Co. Tyrone, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

209. Russula fragilis. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

210. Russula integra. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Donard Demesne, Co. Down, 1885.—H. W. L.

211. Russula alutacea. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

212. Cantharellus cibarius. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1883.—H. W. L.

213. Cantharellus aurantiacus. *Fr.*

Narrow Water Demesne, 1883, Tollymore Park, and Donard Demesne, 1885, Co. Down,—H. W. L.

214. Cantharellus lobatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

215. Marasmius urens. *Fr.*

Donard Demesne, Co. Down, 1885.—H. W. L.

216. Marasmius peronatus. *Fr.*

Rademon, Co. Down, 1885.—H. W. L.

217. Marasmius oreades. *Fr.*

Derrytrasna, Co. Armagh, grass bank along roadside, 1883; Newcastle, Co. Down, abundant among the sandhills, 1885.—H. W. L. S. A. Stewart sent me specimens of this collected many years ago by him in the latter locality.

218. Marasmius erythropus. *Fr.*

Donard Demesne, Co. Down, abundant in upper part of the wood near the granite quarry; and Rademon, Co. Down, 1885.—H. W. L.

219. Marasmius rotula. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rosstrevor Wood, 1883; and Rademon, 1885, Co. Down.—H. W L.

220. Marasmius androsaceus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

221. Lentinus tigrinus. *Fr.*

Ram's Island, Lough Neagh, 1884. Very rare.—H. W. L.

222. Lentinus flabelliformis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

223. Boletus luteus. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Raughlan, County Armagh; Killymoon, County Tyrone; and Donard Demesne, Co. Down, 1884. —H. W. L.

224. Boletus elegans. *Schum.*

Top of Knockbarragh Hill, 905 feet, Co. Down, 1883; Crawfordsburn, Co. Down, 1884; Tollymore Park, and Donard Demesne, County Down, 1885. Common.—H. W. L.

225. Boletus flavus. *With.*

Donard Demesne, Co. Down, 1883; wood at the Ferry Hill, near Omeath, Co. Louth, 1883; Killymoon, Co. Tyrone, 1884; Rademon, Co. Down, 1885. —H. W. L.

226. Boletus laricinus. *Berk.*

Tollymore Park, 1884, and Donard Demesne, 1885, Co. Down. Not common.—H. W. L.

227. Boletus granulatus. *L.*

Drumcro, near Maralin, County Down, 1884—C. H. Waddell. Donard Demesne, Co. Down, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

228. Boletus bovinus. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Most abundant in heathy places in plantations of larch and Scotch fir, in Donard Demesne, and Tollymore Park, County Down, 1885.—H. W. L.

229. Boletus piperatus. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

230. Boletus chrysenteron. *Fr.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

231. Boletus subtomentosus. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

232. Boletus variecolor. *B. and Br.*

Ardmore Glebe, Co. Armagh, 1884. Rare.—H. W. L.

233. Boletus pachypus. *Fr.*

Killymoon, Co. Tyrone, 1884; Rosstrevor Wood, Donard Demesne, and Tollymore Park, Co. Down, 1885. Common.—H. W. L.

234. Boletus edulis. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Raughlan, County Armagh, 1883; Tollymore Park, and Donard Demesne, County Down, 1884; Rademon, Co. Down, 1885. Not common.—H. W. L.

235. Boletus fragrans. *Vitt.*

Ardmore Glebe, Co. Armagh, 1884. Very rare.—H. W. L.

236. Boletus impolitus. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

237. Boletus æstivalis. *Fr.*

In several plantations about Warrenpoint, Co. Down, 1883.—H. W. L.

238. Boletus satanas. *Lenz.*

Moira Demesne, and Donard Demesne, Co. Down, 1884. Rare.—H. W. L.

239. Boletus luridus. *Fr.*

Gillhall, Co. Down, 1883—C. H. Waddell. Ardmore, Co. Armagh, 1883; Killymoon, County Tyrone, and Tollymore Park, County Down, 1884. Rare.—H. W. L.

240. Boletus scaber. *Fr.*

In a plantation near the Vicarage, Warrenpoint, and Rosstrevor Wood, Co. Down, 1883; Raughlan, Co. Armagh, 1884; Donard Demesne, and Tollymore Park, Co. Down, 1885. Rather common.—H. W. L.

241. Boletus castaneus. *Bull.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

242. Polyporus brumalis. *Fr.*

Raughlan Island, Co. Armagh, 1884.—H. W. L.

243. Polyporus lentus. *Berk.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

244. Polyporus perennis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

245. Polyporus squammosus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, and Raughlan, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

246. Polyporus varius. *Fr.*

Tollymore Park, Co. Down, 1884.—C. H. Waddell.

247. Polyporus giganteus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rosstrevor Wood, Co. Down, 1883.—C. H. Waddell. Langford Lodge, Co. Antrim, 1883.—H. W. L.

248. Polyporus salignus. *Fr.*

On a large willow, Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

249. Polyporus chioneus. *Fr.*

Killymoon, County Tyrone, 1884.—H. W. L.

250. Polyporus fumosus. *Fr.*

On a rotten stump, near the House, Narrow Water Demesne, Co. Down, 1883.—H. W. L.

251. Polyporus adustus. *Fr.*

On a gate post, near Derryadd Dispensary, Lurgan, Co. Armagh, 1883. —H. W. L.

252. Polyporus spumeus. *Fr.*

Killymoon, Co. Tyrone, 1884; Tollymore Park, County Down, 1885.—H. W. L.

253. Polyporus dryadeus. *Fr.*

Shane's Castle Park, Co. Antrim; and Tollymore Park, County Down; 1883. –H. W. L.

254. Polyporus betulinus. *Fr.*

Tollymore Park, Co. Down, 1884; Rademon, Co. Down, 1885.—H. W. L.

255. Polyporus pallescens. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

256. Polyporus fomentarius. *Fr.*

Lurgan Demesne, Co. Armagh, 1883; Loughrey, Co. Tyrone, 1884.—H. W. L. Portavoe, Co. Down, 1885.—J. B. A. Hughes. Rademon, County Down, 1885.—H. W. L.

257. Polyporus ignarius. *Fr.*

Drumero, near Maralin; and Gilhall, County Down; 1883—C. H. Waddell. Ardmore, Co. Armagh, 1884.—H. W. L.

258. Polyporus fraxineus. *Fr.*

On the stump of a large ash tree, Killyglen, near Larne, County Antrim, 1884.—H. W. L.

259. Polyporus annosus. *Fr.*

Bangor, Co. Down, 1836; and Collin Glen, Co. Antrim, 1841.—W. Thompson. Narrow Water, 1883; Crawfordsburn, 1883; Belvoir Park, 1884; Donard Demesne, and Tollymore Park, 1885. Common in County Down.—H. W. L.

260. Polyporus radiatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rademon, County Down, 1885. Not common.—H. W L.

261. Polyporus fibula. *Fr.*

On the inside of the sash of a window, in the "prophet's chamber" of St. Patrick's House, Broughshane, Co. Antrim, 1883.—H. W. L.

262. Polyporus velutinus. *Fr.*

Holywood, Co. Down, 1841.—W. Thompson. Ardmore, Co. Armagh, 1883; Tollymore Park, Co. Down, 1885.—H. W. L.

263. Polyporus versicolor. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Cultra, Co. Down, 1835.—W. Thompson. Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore, Co. Armagh, 1883. Very common, and variable.—H. W. L.

264. Polyporus abietinus. *Fr.*

Rosstrevor Wood, Co. Down, 1883.—C. H. Waddell. Raughlan, County Armagh, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

265. Polyporus ferruginosus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

266. Polyporus violaceus. *Fr.*

On a dead Scotch fir at Raughlan, Co. Armagh, 1885.—H. W. L.

267. Polyporus purpureus. *Fr.*

On decayed willow trees; common throughout the parish of Montiaghs, or Ardmore, Co. Armagh, 1884.—H. W. L.

268. Polyporus medulla-panis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. On the inside of the wooden cover of a well, Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

269. Polyporus vulgaris. *Fr.*

Killymoon, County Tyrone, 1884.—H. W. L.

270. Polyporus vaporarius. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

271. Merulius corium. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

272. Merulius lacrymans. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

273. Fistulina hepatica. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1883. Rare.—H. W. L.

274. Hydnum repandum. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Wood at the Ferry Hill, near Omeath, Co. Louth, and Rosstrevor Wood, Co. Down, 1883; abundant in Donard Demesne, Co. Down, 1884.—H. W. L.

275. Hydnum graveolens. *Del.*

On an oak stump in Tollymore Park, County Down, 1884. Very rare.—H. W. L.

276. Irlex obliquus. *Fr.*

Warrenpoint, Co. Down, 1883; Ardmore Glebe, County Armagh, 1884.—H. W. L.

277. Radulum orbiculare. *Fr.*

Rosstrevor Wood, County Down, on dead hazel, 1883.—C. H. Waddell.

278. Grandinia granulosa. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

279. Craterellus cornucopioides. *Fr.*

Rosstrevor Wood, 1883, and Donard Demesne, 1885, Co. Down.—H. W. L.

280. Craterellus sinuosus. *Fr.*

Donard Demesne, Co. Down, 1884.—H. W. L.

281. Thelephora cristata. *Fr.*

On beech leaves near the grotto in Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

282. Thelephora mollissima. *P.*

Rademon, Co. Down, 1885.—H. W. L.

283. Thelephora laciniata. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

284. Thelephora cæsia. *P.*

Hillsborough Demesne, County Down, 1883.—H. W. L.

285. Stereum purpureum. *Fr.*

Near Belfast, Templeton (*Thelephora purpurea*), Ann. Nat. Hist., Vol. V. Raughlan, County Armagh, 1884.—H. W. L.

286. Stereum hirsutum. *Fr.*

Near Belfast, Templeton (*Thelephora hirsuta*), Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1882; Killymoon, Co. Tyrone, 1884; Maralin, 1884, and Rademon, and Donard Demesne, County Down, 1885.—H. W. L.

287. Stereum sanguinolentum. *Fr.*

Donard Demesne, Co. Down, 1885, on stump of larch, and felled Scotch firs. Not common.—H. W. L.

288. Hymenochæte rubiginosa. *Lev.*

Near Belfast, Templeton (*Thelephora rubiginosa*), Ann. Nat. Hist., Vol. V. Raughlan, Co. Armagh, 1884; Killymoon, Co. Tyrone, 1884; Rademon, Co. Down, 1885.—H W. L.

289. Corticium evolvens. *Fr.*

Rosstrevor Wood, Co. Down, 1883.—H. W. L.

290. Corticium arachnoideum. *Berk.*

Holywood House, Co. Down, 1841.—W. Thompson. Killymoon, County Tyrone, 1884.—H. W. L.

291. Corticium læve. *Fr.*

Cultra, and Bangor, Co. Down, 1835.—W. Thompson. Caledon Demesne, and Killymoon, Co. Tyrone, 1884; Ardmore, Co. Armagh, 1884; Donard Demesne; and Tollymore Park, County Down; 1885.—H. W. L.

292. Corticium velutinum. *Fr.*

The Oaks, Co. Derry, 1842.—G. Lyle. Stranmillis, near Belfast, 1885. —S. M. Malcomson. Raughlan, Co. Armagh, 1885.—H. W. L.

293. Corticium cœruleum. *Fr.*

Near Belfast, Templeton (*Thelephora cœrulea*), Ann. Nat. Hist., Vol. V.

294. Corticium calceum. *Fr.*

Near Belfast, Templeton (*Thelephora calcea*), Ann. Nat. Hist., Vol. V. Stranmillis, near Belfast, 1884.—S. M. Malcomson.

295. Corticium quercinum. *P.*

On decayed beech, Warrenpoint, Co. Down, 1883.—C. H. Waddell.

296. Corticium nudum. *Fr.*

Bark of laurel, Sydenham, Co. Down, 1883.—W. H. Patterson. Rosstrevor Wood, Co. Down, 1883.—H. W. L.

297. Corticium confluens. *Fr.*

Near Belfast, Templeton (*Thelephora epidermea*, *Pers*), Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

298. Corticium comedens. *Fr.*

On a decayed oak branch, Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

299. Corticeum lacteum. *Fr.*

Near Belfast, Templeton (*Himantia candida*), Ann. Nat. Hist., Vol. V.

300. Sparassis laminosa.

On the occasion of the first Fungus Foray in Ireland, to Shane's Castle, Co. Antrim, 1883, I found an immense *Sparassis* growing on the stump of an old oak near the ruins. It resembled a huge cauliflower, and was more plaited than *S. crispa*, as figured in Cooke's Handbook, and by Berkeley in Intellectual Observer. If not *S. laminosa*, it comes very near it.—H. W. L.

301. Clavaria fastigiata. *D. C.*

Near Belfast, Templeton (*Clavaria pratensis*), Ann. Nat. Hist., Vol. V. Rademon, Co. Down, 1885.—H. W. L.

302. Clavaria coralloides. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Very abundant in Shane's Castle Park, Co. Antrim, 1883; Killymoon, County Tyrone, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

303. Clavaria cinerea. *Bull.*

Very abundant in the woods of Killymoon, Co. Tyrone, 1884.—H. W. L.

304. Clavaria rugosa. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Shane's Castle Park, Co. Antrim, abundant, 1883; Donard Demesne, Co. Down, 1884.—H. W. L.

305. Clavaria fusiformis. *Sow.*

Near the waterfall, opposite the Ferry at Narrow Water, on County Louth side; and Ardmore Glebe, Co. Armagh; 1883.—H. W. L.

306. Clavaria inæqualis. *Müll.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

307. Clavaria vermiculata. *Scop.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Drumcro, near Maralin, Co. Down, 1884.—C. H. Waddell.

308. Clavaria fragilis. *Holmsk.*

Slieve Donard, Co. Down, at 1100 feet, 1884; Donard Demesne, and Rademon, Co. Down, 1885.—H. W. L.

309. Clavaria pistillaris. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

310. Clavaria tuberosa. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

311. Clavaria cornea. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

312. Typhula erythropus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

313. Pistillaria micans. *Fr.*

Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

314. Pistillaria puberula. *Berk.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

315. Tremella fimbriata. *P.*

Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

316. Tremella foliacea. *P.*

Near Londonderry, 1883.—G. V. Craig. Ardmore Glebe, Co. Armagh, 1883; Rademon, Co. Down, 1885.—H. W. L.

317. Tremella mesenterica. *Retz.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Maralin, Co. Down, 1883.—C. H. Waddell. Ardmore Glebe, County Armagh; Killymoon, County Tyrone, 1884; Rademon, Co. Down, 1885.—H. W. L.

318. Tremella albida. *Hud.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh, 1883; Killymoon, Co. Tyrone, and Rosstrevor Wood, Co. Down, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

319. Tremella intumescens. *Sow.*

Portavoe, Co. Down, 1884.—J. B. A. Hughes.

320. Hirneola auricula-judæ. *Berk.*

On very old and large elder trees inside the ruins of Maghera Church, near Newcastle, 1884; and Donard Demesne, Co. Down, 1885.—H. W. L.

321. Næmatelia encephala. *Fr.*

On a black alder stump, Raughlan, County Armagh, 1884. Very rare.—H. W. L.

322. Dacrymyees stillatus. *Nee.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh; Tollymore Park; and Donard Demesne, Co. Down; 1885. Common. —H. W. L.

323. Phallus impudicus. *Linn.*

Castledawson Demesne, Co. Derry.—S. A. Stewart. Near Holywood, Co. Down, 1883.—R. L. Praeger. Killymoon, Co. Tyrone, 1883; Tollymore Park; and sandhills near Newcastle, Co. Down; 1885. Not common.—H. W. L.

324. Bovista nigrescens. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh, 1882; Killymoon, Co. Tyrone, 1883. Rare.—H. W. L.

325. Bovista plumbea. *P.*

I found one specimen among the sandhills, near Newcastle, Co. Down, in October, 1884. Rare.—H. W. L.

326. Lycoperdon giganteum. *Batsch.*

Shane's Castle Park, Co. Antrim, 1883.—H. W. L. This species is not common in the district. I heard of a large specimen found near Belfast, in 1884, that was exhibited in a seedsman's window in that town; and in September, 1885, one was sent to me weighing 8 lbs., and measuring 3 ft. 10 in. in girth. It grew in Belvoir Park, Co. Down.

327. Lycoperdon cœlatum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rademon, and Donard Demesne, County Down, 1885.—H. W. L.

328. Lycoperdon pusillum. *Fr.*

Killymoon, Co. Tyrone, 1884. Not common.—H. W. L.

329. Lycoperdon saccatum. *Vahl.*

Ardmore Glebe, Co. Armagh, 1883; Moira Demesne, Co. Down, 1884. —H. W. L.

330. Lycoperdon gemmatum. *Fr.*

Near the Ness Waterfall, Co. Derry, 1842.—W. Thompson. Raughlan, and Ardmore, Co. Armagh, 1883; Rademon, Tollymore Park, and Donard Demesne, County Down, 1885. Common..—H. W. L.

331. Lycoperdon pyriforme. *Schæff.*

Rosstrevor Wood, Co. Down, 1883; Killymoon, Co. Tyrone, and Ardmore Glebe, Co. Armagh, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

332. Scleroderma vulgare. *Fr.*

Narrow Water Demesne, Co. Down, and Shane's Castle Park, County Antrim, 1883; Ardmore, Co. Armagh, Killymoon, Co. Tyrone, and Donard Demesne, Co. Down, 1885. Common.—H. W. L.

333. Scleroderma bovista. *Fr.*

Near Belfast, 1884.—J. J. Andrew.

334. Lycogala epidendrum. *Fr.*

Ardmore, Co. Armagh, 1883.—H. W. L. By the Lagan's banks, near Belfast, 1885.—S. M. Malcomson.

335. Æthalium septicum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

336. Spumaria alba. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. This curious plant closely resembles the droppings of some bird lying on moss or grass. Donard Demesne, Co. Down, 1885.—H. W. L.

337. Didymium furfaceum. *Fr.*

Killymoon, County Tyrone, 1884.—H. W. L.

338. Didymium melanopus. *Fr.*

Donard Demesne, Co. Down, 1884.—H. W. L.

339. Physarum cinerum.

Mr. W. B. Grove so named a plant on bark of decayed holly from Rosstrevor Wood, Co. Down, 1885.—H. W. L.

340. Didymium physaroides. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

341. Angioridium sinuosum. *Grev.*

Near Belfast, Templeton, (*Physarum sinuosum*), Ann. Nat. Hist., Vol. V.

342. Craterium minutum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Maralin, County Down, 1884.—C. H. Waddell.

343. Stemonitis fusca. *Roth.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Warrenpoint, Co. Down, 1883.—C. H. Waddell.

344. Stemonitis typhoides. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

345. Stemonitis ovata. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

346. Dictydium umbilicatum. *Schrad.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

347. Arcyria incarnata. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Errigle, County Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1883.—H. W. L.

348. Arcyria nutans. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

349. Trichia chrysosperma. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

350. Trichia varia. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

351. Trichia serpula. *P.*

Purdysburn, Co. Down, 1885.—S. M. Malcomson.

352. Perichæna populina. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

353. Licea cylindrica. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

354. Licea fragiformis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

355. Cyathus striatus. *Hoffm.*

Near Belfast, 1875.—W. H. Patterson.

356. Crucibulum vulgare. *Tul.*

Near Belfast, Templeton (*Nidularia crucibulum, Pers.*), Ann. Nat. Hist., Vol. V.

357. Sphærobolus stellatus. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

358. Phoma concentricum. *Desm.*

On leaves of *Yucca*, Raughlan, Co. Armagh, 1884.—H. W. L.

359. Sphæropsis taxi. *Berk.*

Near Belfast, Templeton (*Sphæria Taxi, Sow.*), Ann. Nat. Hist., Vol. V.

360. Diplodia ilicis. *Curr.*

Near Belfast, Templeton (*Sphæria ilicis, Schleich*), Ann. Nat. Hist., Vol. V.

361. Stagonospora pini.

This new species was collected at Raughlan, Co. Armagh, 1883. The description is given in a paper by W. B. Grove on "New or Noteworthy Fungi," in *Journal of Botany*, 1885:—"Peritheciis epiphyllis, tectis, sparsis, rotundatis, atris; sporulis pallide luteolis, singulis hyalinis, cylindraceo-fusoides, utrinque subobtusis, 1 dein 3 septatis, 16—20 μ x 3—4 μ. In foliis Pini Sylvestris. Hibernia, H. W. Lett, August."

362. Septoria castanæcola. *Desm.*

Warrenpoint Vicarage, 1883; Tollymore Park, County Down, 1884.—H. W. L.

363. Ascochyta dianthi. *Berk.*

Ardmore Glebe, Co. Armagh, 1883; Warrenpoint, County Down, 1884.—H. W. L.

364. Asteroma reticulatum. *Berk.*

Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

365. Rabenhorstia tiliæ. *Fr.*

Near Belfast, Templeton (*Sphæria tilliæ, Pers.*), Ann. Nat. Hist., Vol. V.

366. Discella carbonacea. *Fr.*

On dead twigs of *Golden Willow*, in Ardmore Churchyard, Co. Armagh, 1884.—H. W. L.

367. Ceuthospora lauri. *Grev.*

Desertcreat, Co. Tyrone, 1883.—H. W. L.

368. Melanconium bicolor. *Nees.*

Raughlan, Co. Armagh, 1884.—H. W. L.

369. Coryneum disciforme. *Kze.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell.

370. Phragmidium mucronatum. *Link.*

Near Belfast, Templeton (*Aregma mucronatum, F.*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Near Strabane, Co. Tyrone, 1883; Ardmore, Co. Armagh, 1884. Common.—H. W. L.

371. Phragmidium bulbosum. *Schl.*

Near Belfast, Templeton (*Uredo ruborum* and *Aregma bulbosum*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Warrenpoint, Co. Down; Ardmore, County Armagh; 1883.—H. W. L.

372. Phragmidium gracile. *Grev.*

Collin Glen, Co. Antrim, 1836.—W. Thompson. Errigle, Co. Cavan.—T. H. Moorhead. Ardmore, Co. Armagh, 1883.—H. W. L.

373. Phragmidium obtusum. *Link.*

Uredo spores on *Potentilla reptans*, near Strabane, 1883; and Loughrey, Co. Tyrone, 1884.—H. W. L.

374. Triphragmium ulmariæ. *Link.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1883; banks of the Lagan, near Belfast, Co. Antrim, 1885.—H. W. L.

375. Puccinia graminis. *P.*

Near Belfast, Templeton (*Uredo rubigo*), Ann. Nat. Hist., Vol. V. Near Belfast.—W. Thompson. Errigle, County Cavan, 1884.—T. H. Moorhead. Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore, Co. Armagh, 1883. Common.—H. W. L.

376. Puccinia arundinacea. *Hedw.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. On reeds in Closet River, at Raughlan, County Armagh; Bog Meadows, near Belfast, 1885.—H. W. L.

377. Puccinia striola. *Link.*

Balmoral, near Belfast, Co. Antrim, 1885.—S. M. Malcomson.

378. Puccinia coronata. *Corda.*

Banks of the Lagan, near Belfast, 1884.—J. J. Andrew.

379. Puccinia glechomatis. *D. C.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

380. Puccinia menthæ. *P.*

Near Belfast, Templeton (*Uredo labiatarum*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Warrenpoint, Co. Down; and Ardmore, Co. Armagh; 1883.—H. W. L.

381. Puccinia compositarum. *Sch.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1884; Banks of the Lagan, near Belfast.—H. W. L.

382. Puccinia glomerata. *Grev.*

Near Belfast, Templeton (*Uredo senecionis*), Ann. Nat. Hist., Vol. V. Warrenpoint, Co. Down; Ardmore, Co. Armagh; Bog Meadows, near Belfast, Co. Antrim; 1884.—H. W. L.

383. Puccinia variabilis. *Grev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Clandeboy, and Ballylesson, Co. Down; Ardmore Glebe, Co. Armagh; 1884.—H. W. L.

384. Puccinia glomerata. *Link.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

385. Puccinia umbelliferarum. *D. C.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Middletown, Co. Armagh (on *Hydrocotyle*).—C. H. Waddell. Ardmore, Co. Armagh; very abundant on *Sium latifolium*; 1884.—H. W. L.

386. Puccinia ægopodi. *Link.*

Near Belfast, Templeton (*Sphæria ægopodii*), Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1883.—H. W. L.

387. Puccinia saniculæ. *Grev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

388. Puccinia smyrnii. *Corda.*

Ardmore Glebe, Co. Armagh, 1883; Crawfordsburn, County Down, 1884. —H. W. L.

389. Puccinia anemones. *P.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

390. Puccinia violarum. *Link.*

Near Belfast, Templeton (*Uredo violarum, D. C.*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, Co, Armagh, 1884.—H. W. L.

391. Puccinia lychnidearum. *Link.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

392. Puccinia umbilici. *Guep.*

Near Strabane, County Tyrone, 1883.—H. W. L.

393. Puccinia epilobii. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

394. Puccinia circeæ. *P.*

Shane's Castle Park, Co. Antrim, 1883. Rare.—H. W. L.

395. Puccinia fabæ. *Link.*

Warrenpoint, Co. Down, 1883.—H. W. L.

396. Puccinia fallens. *Cooke.*

Near Belfast, Templeton (*Uredo leguminosarum*), Ann. Nat. Hist., Vol. V. Warrenpoint, Co. Down; and Ardmore, County Armagh; 1883—H. W. L.

397. Puccinia buxi. *D. C.*

Wolfhill, near Belfast, 1842.—W. Thompson. Errigle, County Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

398. Puccinia hieracii. *Mart.*

Crawfordsburn, Co. Down, 1884.—H. W. L. For description see M. C. Cooke's "Micro Fungi," 4th edit., p. 207.

399. Puccinia ægra. *Grove.*

Drumcro, near Maralin, Co. Down, 1883.—C. H. Waddell. Warrenpoint Vicarage Garden, 1883.—H. W. L. For description see *Journal of Botany*, September, 1883.

400. Puccinia malvacearum. *Cor.*

See Grevillea, vol. ii. pp. 47 and 137. Carlingford, County Louth, on mallow; Ardmore, Co. Armagh, on mallow and hollyhock; 1883.—H. W. L.

401. Gymnosporangium juniperi. *Lk.*

I found a specimen of this on grass under fir trees in the Fort Grove, near Moira Rectory, Co. Down, July, 1884. Rare.—H. W. L.

402. Podisoma juniperi. *Fr.*

Near Belfast, Templeton (*Podisoma juniperi-sabinæ*), Ann. Nat. Hist., Vol. V. Wolfhill, Belfast, County Antrim, on upright juniper, 1837.—W. Thompson.

403. Tilietia caries. *Tul.*

Near Belfast, Templeton (*Uredo caries, D. C.*), Ann. Nat. Hist., Vol. V.

404. Ustilago carbo. *Tul.*

Near Belfast, Templeton (*Uredo segetum, P.*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore, Co. Armagh, 1883. Very common on ears of oats.—H. W. L.

405. Urocystis pompholygodes. *Schlecht.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, County Armagh, 1884, on *Ranunculus repens* and *acris*. Common.—H. W. L.

406. Uromyces appendiculata. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

407. Uromyces apiculosa. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

408. Uromyces ficariæ. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

409. Uromyces intrusa. *Lev.*

Carr's Glen, near Belfast, Co. Antrim, 1885.—S. M. Malcomson. Collin Glen, Co. Antrim, 1882.—H. W. L.

410. Uromyces concentrica. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Banks of the Lagan, near Belfast, Co. Antrim, 1885.—S. M. Malcomson.

411. Coleosporium tusilaginis. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Clonallon, Co. Down; and Ardmore, Co. Armagh; 1883. Very common.—H. W. L.

412. Coleosporium petasites. *Lev.*

Clonallon, Co. Down, 1883.—H. W. L.

413. Coleosporium sonchi-arvensis. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Warrenpoint Vicarage, Co. Down, 1883.—H. W. L.

414. Coleosporium rhinantheacearum. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Fortwilliam, near Moira, Co. Down, 1883,—C. H. Waddell.

415. Melamspora salicina. *Lev.*

On *Salix viminalis*, Ardmore, Co. Armagh, 1883.—H. W. L.

416. Melamspora betulina. *Desm.*

Ballyvalley, Co. Down, 1883.—C. H. Waddell.

417. Melamspora euphorbiæ. *Cast.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Near Newcastle, Co. Down, 1884.—H. W. L.

418. Cystopus candidus. *Lev.*

Near Belfast, Templeton (*Uredo candida, P.*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Warrenpoint, Co. Down; Ardmore, Co. Armagh; 1883. Very common.—H. W. L.

419. Uredo potentillarum. *D. C.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Loughrey, Co. Tyrone; side of the Lagan, near Belfast, on "Barren Strawberry" (*Potentilla fragariastrum*); 1885.—H. W. L.

420. Uredo hypericorum. *D. C.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

421. Uredo vacciniorum. *P.*

Slieve Donard, Co. Down, 1883.—H. W. L.

422. Uredo bifrons. *Grev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

423. Trichobasis petroselini. *B.*

Abundant on *Smyrnium olusatri*, at Ardmore Glebe, Co. Armagh, 1884. —H. W. L.

424. Trichobasis suaveolens. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Bank of the Lagan, near Belfast, 1885.—S. M. Malcomson. Analoist, Co. Armagh; and Warrenpoint, Co. Down; 1883. Common.—H. W. L.

425. Trichobasis rumicum. *D. C.*

For description see M. C. Cooke's "Rust, Smut, and Mildew," 4th edit. p. 225. Near Belfast, 1884.—J. J. Andrew.

426. Lecythea lini. *Lev.*

Near Belfast, Templeton (*Uredo lini, D. C.*), Ann. Nat. Hist., Vol. V. Shore of Lough Neagh, at Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

427. Ræstelia lacerata. *Tul.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Derryloist, Co. Armagh, 1884.—H. W. L.

428. Æcidium epilobii. *D. C.*

Banks of the Lagan, near Belfast, 1885.—S. M. Malcomson.

429. Æcidium euphorbiæ. *P.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

430. Æcidium berberidis. *P.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

431. Æcidium crassum var. periclymeni. *D. C.*

Errigle, Co, Cavan, 1884.—T. H. Moorhead. Near Shaw's Bridge, on the Lagan, Co. Antrim, 1885.—S. M. Malcomson.

432. Æcidium ranunculacearum. *D. C.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh; Balmoral, near Belfast, Co. Antrim, 1883. Common.—H. W. L.

433. Æcidium grossulariæ. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Errigle, County Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, Co. Armagh, 1882. Very common.—H. W. L.

434. Æcidium urticæ. *D. C.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1885. Not common.—H. W. L.

435. Æcidium taraxaci. *K. et Schm.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Near Belfast, 1884.—J. J. Andrew. Ardmore, Co. Armagh, 1884.—H. W. L.

436. Æcidium compositarum var. tussilaginis. *P.*

Ardmore, Co. Armagh; Ormeau, and Newcastle, County Down; 1885.—H. W. L.

437. Æcidium compositarum var. jacobeæ. *Grev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Near Belfast, 1884.—J. J. Andrew.

438. Æcidium primulæ. *D. C.*

By the side of the Lagan, near Belfast, 1885.—S. M. Malcomson.

439. Æcidium rubellum. *P.*

Banks of the Lagan, near Belfast, 1884.—J. J. Andrew.

440. Æcidium ari. *Berk.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

441. Æcidium allii. *Grev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

442. Ceratium hydnoides. *A. and S.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

443. Stilbum bicolor. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

444. Stilbum vulgare. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

445. Mystrosporium stemphylium. *Corda.*

On ripe seed vessels of garden Wallflower, Warrenpoint Vicarage, County Down, 1883. (The fig. in Cooke's Handbook, p. 578, does not appear to belong to this species.)—H. W. L.

446. Cladosporium herbarum. *Lk.*

On dead cabbage leaf, Ardmore, Co. Armagh, 1884.—H. W. L.

447. Cladosporium compactum. *Sacc.*

Mr. W. B. Grove considers some specimens on ripe garden pea pods, from Warrenpoint Vicarage, Co. Down, 1883, are to be referred to this species.—H. W. L.

448. Aspergillus glaucus. *Lk.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Common everywhere on decaying bread, cheese, jam, &c.—H. W. L.

449. Aspergillus candidus. *Lk.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, County Armagh, 1883. On berries of *Tamus communis*, old kid gloves, and fruit stones, 1884.—H. W. L.

450. Peronospora infestans. *Mont.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Common everywhere; in some seasons much later than others in making its appearance on the potato crop, as in 1885.—H. W. L.

451. Peronospora nivea. *Unq.*

On hogweed (*Ægopodium podagra*), Warrenpoint, Co. Down, 1883.—H. W. L.

452. Peronospora gangliformis. *Berk.*

On groundsel leaves, Warrenpoint, Co. Down, 1883.—H. W. L.

453. Peronospora candida. *Fekl.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

454. Polyactis cana. *Berk.*

On a dead strawberry leaf, Ardmore Glebe Garden, Co. Armagh, 1884.—H. W. L.

455. Polyactis vera. *Berk.*

Near Belfast, Templeton (*Botrytis vera.* Fr.), Ann. Nat. Hist., Vol. V.

456. Stysanus stemonitis. *Corda.*

Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

457. Monilia racemosa. *Purt.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

458. Sepedonium chrysospermum. *Lk.*

Near Belfast, Templeton (*Strachylidium diffusum.* Fr.), Ann. Nat. Hist., Vol. V. On decaying Boleti, especially *Boletus pachypus*, Gilhall, Co. Down, 1883.—C. H. Waddell. Donard Demesne, and Tollymore Park, County Down, 1884. Common.—H. W. L.

459. Mucor mucedo. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. On paste, jam, &c. Very common everywhere.—H. W. L.

460. Mucor caninus. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

461. Mucor amethysteus. *Berk.*

Ardmore, Co. Armagh, on rotting pears, 1883.—H. W. L.

462. Pilobolus crystallinus. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

463. Onygena equina. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

464. Microsphæria berberidis. *Lev.*

Finnebrogue, Co. Down, 1885, on barberry leaves.—H. W. L.

465. Microsphæria grossulariæ. *Lev.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore Glebe, Co. Armagh, very abundant in autumn of 1885.—H. W. L.

466. Erysiphe martii. *Lk.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, and Warrenpoint, County Down, 1883.—H. W. L.

467. Erysiphe montagnei. *Lev.*

Ardmore, Co. Armagh, 1884, on burdock (*Arctium lappa*) leaves.—H. W. L.

468. Eurotium herbariorum. *Lk.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh, 1882. Common.—H. W. L.

469. Helvella crispa. *Fr.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

470. Helvella lacunosa. *Afz.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

471. Mitrula paludosa. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Slieve Donard, Co. Down, 1885.—S. M. Malcomson. Mountain near Hilltown, Co. Down, 1885, on dead heather (*Calluna vulgaris*) in water.—H. W. L.

472. Leotia lubrica. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

473. Geoglossum glabrum. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

474. Peziza venosa. *P.*

On a gravelled walk, Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

475. Peziza badia. *P.*

Warrenpoint Vicarage, Co. Down. 1883 Killymoon, Co. Tyrone, 1884.—H. W. L.

476. Peziza cochleata. *Huds.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

477. Peziza leporina. *Batsch.*

Killymoon, County Tyrone, 1884. Very rare.—H. W L

478. Peziza aurantia. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

479. Peziza vesiculosa. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

480. Peziza humosa. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

481. Peziza granulata. *Bull.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Killymoon, Co. Tyrone; Ardmore, Co. Armagh; Ormeau Park, Co. Down; 1884. Very common.—H. W. L.

482. Peziza coccinea. *Jacq.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. This is mentioned in Harris's Down as having been found at Kilwarlin, near Hillsborough. Ardmore Glebe Garden, Co. Armagh, 1884. Rare.—H. W. L.

483. Peziza brunnea. *A. and S.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Banks of the Lagan, near Belfast, 1885.—S. M. Malcomson.

484. Peziza trechispora. *B. and Br.*

Near Ardmore Church, Co. Armagh, 1885. Not common.—H. W. L.

485. Peziza scutellata. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

486. Peziza stercorea. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1884.—H. W. L.

487. Peziza virginea. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh, on dead twigs of lime tree, 1884.—H. W. L.

488. Peziza nivea. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

489. Peziza calycina. *Schum.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Warrenpoint, Co. Down, 1883, on a fir tree.—H. W. L.

490. Peziza papillaris. *Bull.*

Near Belfast, Templeton (*Peziza papillata.* P.), Ann. Nat. Hist., Vol. V.

491. Peziza villosa. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

492. Peziza inflexa. *Bolt.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

493. Peziza cinerea. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Sallagh Braes, near Larne, Co. Antrim, 1884, on rotten wood.—H. W. L.

494. Peziza fusaroides. *Berk.*

Near Belfast, Templeton (*Fusarium tremelloides.* Grev.), Ann. Nat. Hist., Vol. V.

495. Helotium æruginosum. *Fr.*

Shane's Castle Park, County Antrim, 1883; Killymoon, Co. Tyrone, and Rosstrevor Wood, County Down, 1884; Tollymore Park, County Down, 1885. The stained wood is common; while the fully developed *Helotium* is rare, except in the last locality, where I found it in abundance, October, 1885.—H. W. L.

496. Helotium calyculus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

497. Helotium citrinum. *Fr.*

Near Belfast, Templeton (*Peziza citrina.* Hedw.), Ann. Nat. Hist., Vol. V.

498. Helotium lenticulare. *Fr.*

Near Belfast, Templeton (*Peziza lenticularis.* Bull), Ann. Nat. Hist., Vol. V.

499. Helotium rhizophilum. *Fckl.*

By the side of the Bloody Burn, Slieve Donard, Co. Down, 1885.—H. W. L.

500. Helotium aciculare.

Near Belfast, Templeton (*Peziza acicularis.* Bull), Ann. Nat. Hist., Vol. V.

501. Patellaria atrata. *Fr.*

Lurgan Demesne, and Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884. Common.—H. W. L.

502. Patellaria lecideola. *Fr.*

Sallagh Braes, near Larne, Co. Antrim, 1884.—H. W. L.

503. Ascobolus furfaceus. *P.*

Ardmore, Co. Armagh; Killymoon, County Tyrone, 1884. Common.—H. W. L.

504. Bulgaria inquinans. *Fr.*

Lurgan Demesne, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884. Abundant.—H. W. L.

505. Bulgaria sarcoides. *Fr.*

Near Belfast, Templeton (*Tremella sarcoides.* With.), Ann. Nat. Hist., Vol. V. Greyabbey, County Down, 1883.—R. L. Praeger. Narrow Water Demesne, 1883; Rademon, and Tollymore Park, Co. Down, 1885.—H. W. L.

506. Elaphomyces variegatus. *Vitt.*

Donard Demesne, Co. Down, under beech trees near the Spa Cottage, 1885.—H. W. L.

507. Elaphomyces granulatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

508. Phacidium coronatum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist, Vol. V.

509. Phacidium ilicis. *Fr.*

Warrenpoint and Rosstrevor, Co. Down, 1883; Ardmore, Co. Armagh, 1883. Common.—H. W L.

510. Heterosphæria patella. *Grev.*

Loughrey, Co. Tyrone, 1884; Sallagh Braes, near Larne, County Antrim, 1884; Ardmore, County Armagh, 1884.—H. W. L.

511. Rhytisma acerinum. *Fr.*

Near Belfast, Templeton, Ann. Hist., Vol. V. Ardmore, Co. Armagh; Killymoon, Co. Tyrone; Maralin, Warrenpoint, Donard Demesne, and Tollymore Park, Co. Down, 1883. Very common and abundant wherever there are sycamore trees.—H. W. L.

512. Hysterium pulicare. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

513. Hysterium fraxini. *P.*

Near Belfast, Templeton, Ann. Nat. Hist Vol. V. Killymoon, County Tyrone, on ash twigs, 1884.—H. W. L.

514. Hysterium (Hypoderma) virgultorum. *D. C.*

Near Belfast, Templeton (*Hysterium rubi.* P.), Ann. Nat. Hist., Vol. V.

515. Hysterium (Hypoderma) hederæ. *De Not.*

Sallagh Braes, near Larne, Co. Antrim, 1884; Ardmore Glebe, County Armagh, 1885. Not common.—H. W. L.

516. Hysterium (Hypoderma) conigenum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

517. Hysterium (Lophodermium) pinastri. *Schræd.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

518. Hysterium (Lophodermium) juniperinum. *D. N.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

519. Stegia ilicis.

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1882; Warrenpoint, Co. Down, 1883; Killymoon, Co. Tyrone, 1884; Donard Demesne, and Tollymore Park, Co. Down, 1884.—H. W. L.

520. Trochila lauro-cerasi. *Fr.*

Desertcreat, Co. Tyrone, 1883; Tollymore Park, County Down, 1884.—H. W. L.

521. Trochila buxi. *Capron.*

Ardmore Glebe, Co. Armagh. I have found this only on dead leaves that have not fallen.—H. W. L.

522. Trochila craterium. *Fr.*

Ardmore, Co. Armagh, 1885.—H. W. L.

523. Torrubia militaris. *Fr.*

Near Belfast, Templeton (*Sphæria militaris.* Fl. Dan.), Ann. Nat. Hist., Vol. V. Near Clonallon Church, Co. Down, 1883.—H. W. L.

524. Epichloe typhina. *Berk.*

Near Belfast, Templeton (*Dothidea typhina.* P.), Ann. Nat. Hist., Vol. V. The Oaks, Co. Derry, 1842,—G. Lyle. Ardmore, County Armagh, 1883.—H. W. L.

525. Hypocrea farinosa. *B. and Br.*

Killymoon, County Tyrone, 1884.—H. W. L.

526. Hypomyces aurantia. *Tul.*

Near Belfast, Templeton (*Sphæria aurantia.* P.), Ann. Nat. Hist., Vol. V.

527. Nectria cinnabarina. *Fr.*

Near Belfast, Templeton (*Sphæria fragiformis*), Ann. Nat. Hist., Vol. V. Warrenpoint, and Ormeau, Co. Down; Ardmore Glebe, Co. Armagh; Killymoon, Co. Tyrone, 1884. Very common everywhere.—H. W. L.

528. Nectria coccinea. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Cave Hill, County Antrim, 1843.—W. Thompson. Errigle, Co. Cavan, 1884.—T. H. Moorhead.

529. Nectria cucurbitula. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

530. Nectria sinopica. *Fr.*

Rosstrevor Wood, Co. Down, 1883; Ardmore Glebe, Co. Armagh, 1883. —H. W. L.

531. Nectria aquifolia. *Berk.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

532. Xylaria corniformis. *Mont.*

Crawfordsburn, 1884; Tollymore Park, 1885; County Down.—H. W. L.

533. Xylaria hypoxylon. *Grev.*

Near Belfast, Templeton, Ann. Nat. Hist. Vol. V. Waringstown, Rosstrevor Wood, Maralin, Narrow Water Demesne, Rademon, Tollymore Park, Co. Down; Killymoon, Co. Tyrone, 1884. Very common everywhere.—H. W. L.

534. Xylaria carpophila. *Fr.*

Near Belfast, Templeton (*Sphæria carpophila.* P.), Ann. Nat. Hist., Vol. V.

535. Ustulina vulgaris. *Tul.*

Falls, Belfast, on a dead *Willow*, 1842.—W. Thompson. Ram's Island, Lough Neagh, Co. Antrim; Raughlan, County Armagh; 1884.—H. W. L.

536. Hypoxylon coccineum. *Bull.*

Florence Court, Co. Fermanagh, 1840.—W. Thompson. Donard Demesne, and Tollymore Park, Co. Down, 1885.—G. Pim and H. W. L.

537. Hypoxylon cohærens. *Fr.*

Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

538. Hypoxylon fuscum. *Fr.*

Near Belfast, Templeton (*Sphæria fusca.* P.), Ann. Nat. Hist., Vol. V. Collin Glen, County Antrim, 1844.—W. Thompson. Ardmore Glebe, and Raughlan, Co. Armagh, 1885.—H. W. L.

539. Hypoxylon rubiginosum. *Fr.*

Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

540. Hypoxylon atropurpureum. *Fr.*

Bangor, Co. Down, 1835.—W. Thompson.

541. Hypoxylon serpens. *Fr.*

Near Belfast, Templeton (*Sphæria serpens.* P.), Ann. Nat. Hist., Vol. V.

542. Eutypa lata. *Tul.*

Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

543. Eutypa flavo-virens. *Tul.*

Near Belfast, Templeton (*Sphæria flavovirens.* Hoffm.) Ann. Nat. Hist., Vol. V.

544. Dothidea ulmi. *Fr.*

Ardmore, Co. Armagh, on fading leaves of *Elm.* Very common, 1883.—H. W. L.

545. Dothidea filicina. *Fr.*

Raughlan, Co. Armagh, 1883.—H. W. L.

546. Diatrype quercina. *Tul.*

Ardmore, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

547. Diatrype verrucæformis. *Fr.*

Ranghlan, and Ardmore, Co. Armagh; Killymoon, Co. Tyrone, 1884.—H. W. L.

548. Diatrype stigma. *Fr.*

Near Belfast, Templeton (*Sphæria stigma.* Hoffm.), Ann. Nat. Hist., Vol. V.

549. Diatrype disciformis. *Fr.*

Near Belfast, Templeton (*Sphæria disciformis.* Hoffm.), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1884. Drumcro, near Maralin, and Tollymore Park, Co. Down, 1885.—H. W. L.

550. Diatrype bullata. *Fr.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Killymoon, County Tyrone, 1884.—H. W. L.

551. Diatrype strumella. *Fr.*

Ardmore Glebe garden, Co. Armagh, 1884—H. W. L.

552. Diatrype nucleata. *Carr.*

Ardmore Glebe garden, Co. Armagh, 1884.—H. W. L.

553. Diatrype ferruginea. *Fr.*

Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

554. Melanconis lanciformis. *Tul.*

Near Belfast, Templeton (*Sphæria lanciformis.* Fr.), Ann. Nat. Hist., Vol. V.

555. Valsa stellulata. *Fr.*

Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

556. Valsa leucostoma. *Fr.*

Ardmore Glebe, County Armagh, 1885, on dead twigs of *Cotoneaster.*—H. W. L.

557. Valsa salicina. *Fr.*

In a garden, at 2, Collin View Terrace, Lisburn Road, Belfast, on dead twigs of *Willow*, 1884.—H. W. L.

558. Valsa leiphemia. *Fr.*

Rosstrevor Wood, Co. Down, 1883.—H. W. L.

559. Cucurbitaria laburni. *De Not.*

Silverwood, near Lurgan, Co. Armagh; several large *Laburnums* dead, and one mass of this fungus, which attacks only old trees; 1885.—H. W. L.

560. Cucurbitaria elongata. *Grev.*

Desertcreat, Co. Tyrone, 1884, on dead *Laburnum.*—H. W. L.

561. Gibbera vaccinii. *Fr.*

Near Belfast, Templeton (*Sphæria vaccinii.* Sow.), Ann. Nat. Hist., Vol. V.

562. Massaria pupula. *Tul.*

Ardmore, Co. Armagh, on a wooden gate post, December, 1883.—H. W. L.

563. Sphæria aquila. *Fr.*

Near Belfast, Templeton (*Sphæria byssiseda.* Tode), Ann. Nat. Hist., Vol. V.

564. Sphæria phæostroma. *Mont.*

Ardmore, Co. Armagh, 1884.—H. W. L.

565. Sphæria spermioides. *Hoffm.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

566. Sphæria moriformis. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

567. Sphæria mammæformis. *P.*

Ardmore, Co. Armagh, 1884, on rotten *Ivy* sticks.—H. W. L.

568. Sphæria pulvis-pyrius. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

569. Sphæria scirpicola. *D. C.*

On dead *Scirpus lacustris*, floating in Lough Neagh, at Raughlan, Co. Armagh, November, 1883.—H. W. L.

570. Sphæria ocellata *B. and Br.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

571. Sphæria herbarum. *P.*

Near Belfast, Templeton (*Cladosporium herbarum.* Lk.), Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1884.—H. W. L.

572. Sphæria acuta. *Moug.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

573. Sphæria pinodes. *B. and Blox.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

574. Sphæria gnomon. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

575. Sphærella maculæformis. *Cooke.*

Ardmore, Co. Armagh, 1884.—H. W. L.

576. Sphærella punctiformis. *P.*

Near Belfast, Templeton (*Sphæria punctiformis*), Ann. Nat. Hist., Vol. V.

577. Sphærella latebrosa. *Cooke.*

Ardmore, County Armagh, 1884, on withered *Sycamore* leaf.—H. W. L.

578. Sphærella osruthii. *Fr.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

579. Stigmatea geranii. *Fr.*

Near Belfast, Templeton (*Dothidea geranii.* Fr.), Ann. Nat. Hist., Vol. V.

580. Dichæna strobilina. *Fr.*

Raughlan, Co. Armagh, 1884.—H. W. L.

581. Capnodium citri.

Waringstown, Co. Down, on *Camellia* leaves in a greenhouse, 1883.—H. W. L.

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1885-1886.)

FORAMINIFERA OF THE BELFAST NATURALISTS' FIELD CLUB'S CRUISE OFF BELFAST LOUGH, IN THE STEAM-TUG "PROTECTOR," JUNE, 1885; ALSO, FORAMINIFERA FOUND BY DR. MALCOMSON, AT ROCKPORT, BELFAST LOUGH.

BY JOSEPH WRIGHT, F.G.S.

IN the summer of this year (1885) the members of the Belfast Naturalists' Field Club engaged the "Protector" for a day's dredging off Belfast Lough. During the cruise a number of dredgings were taken, and materials from the following four places were carefully put aside for future examination, viz. :—

No. 1.—Two miles S. (by compass) of Maiden Lighthouses; sand and shells; 60 fathoms.

No. 2.—Five miles S.S.E. (by compass) of Maiden Lighthouses; mud, stones, and dead shells; 60 fathoms.

No. 3.—Four miles E. (by compass) of Gobbins; mud, stones, and dead shells; 60 fathoms.

No. 4.—Six miles S.S.E. (by compass) of Black Head; sand and shells; 30 fathoms.

The object of the present communication is to give a list of the Foraminifera found in these gatherings.

A few years ago this part of our coast had, on several occasions, been dredged by Mr. William Swanston, F.G.S., and myself, and a list of the Foraminifera found was given in an appendix to the Club's Report, 1875. This,

no doubt, is the reason why so few additions to the Foraminifera of our North-East Coast were obtained from the "Protector" gatherings. S. M. Malcomson, M.D., had also made a most exhaustive search for Foraminifera in shore sand and rock pools in the vicinity of Rockport, Belfast Lough. At this place he found 87 different species, two of them—viz., *Spiroplecta biformis* and *Placopsilina cenomana*—being new to Britain. At my request, Dr. Malcomson very kindly furnished me with a list of the species which he had found, and also their relative abundance. I have given the record of his discoveries in Column 5 of the table of geographical distribution.

For the sake of completeness, I have given in the last column a list of the Foraminifera recorded in my former paper (*loc. cit.*),* and at the end of the table the names of three species which had not been met with in either the "Protector" gatherings or at Rockport. The present list, therefore, comprises all the species that are now known from this part of our coast.†

In conclusion, I have to thank Mr. H. B. Brady, F.R.S., for his kind help and advice in the identification of some of the critical species. I am also much indebted to S. M. Malcomson, M.D., for the very accurate and artistic drawings which accompany this memoir.

* Recent Foraminifera of Down and Antrim, Proceedings Belfast Naturalists' Field Club, app. 1876-7.

† Of late years our increased knowledge of Foraminifera has necessitated many changes both in the names of the genera and species, and, in consequence of these alterations, a number of the species given in my paper on Foraminifera of Down and Antrim (1876-7) are now known by other names. The following is a list of the species which have been so altered, the names by which they had been recorded being given in italics. I have not, however, thought it necessary to note any changes which may have been made in the generic names, as such will be sufficiently obvious to the reader.

Cornuspira involvens, Rs.—*Cornuspira foliacea*, Phil.
Haplophragmium pseudospirale, Will.—*Lituola nautiloidea*, Lamk.
Bolivina dilatata, Rs.=*Textularia pygmæa*, d'Orb.
Lagena lineata, Will.=*Lagena caudata*, d'Orb.
Lagena aspera, Rss.=*Lagena hispida*, Rss.
Lagena hispida, Rss.=*Lagena Jeffreysii*, Brady.
Lagena lævigata, Rss.=*Lagena lucida*, Will.
Lagena lagenoides, Will.=*Lagena ornata*, Will.
Marginulina costata, Batsch.=*Dentalina obliquestriata*, Rss.
Polymorphina gibba, d'Orb., fistulose form=*Polymorphina Orbignyi*, Zbor.
Gypsina versicularis, P. and J.=*Tinoporus lævis*, P. and J.
Gypsina inhærens, Schultze.=*Tinoporus lucidus*, Brady MS.

The following names have been excluded from the present memoir, as they are not now considered good species, viz. :- Biloculina elongata, d'Orb; Spiroloculina canaliculata, d'Orb.; Triloculina Brongniartii, d'Orb.; Lagena Lyellii, Seg.; Lagena trigono-marginata, P. and J.; Lagena oblonga, Seg.; Dentalina guttifera, d'Orb.; Textularia variabilis, Will.; and Discorbina ochracea, Will. I have also thought it best to omit the following, as the specimens found were not typical, and, in consequence, their identification not as reliable as could have been wished, viz. :—Miliolina agglutinans, d'Orb.; Textularia trochus, d'Orb.; Lagena distoma, P. and J.; Lagena gracillima, Seg.; and Nodosaria raphanus, Linn.

The following notes in reference to some of the species found may be of interest:—

Miliolina insignis, *Brady.* (Pl. xxvi. fig. 4, *a*, *b*.)

Miliolina insignis, Brady, 1882, Rep. Foram. H.M.S. Challenger, p. 165, pl. 4, figs. 8-10.

This species, in contour, resembles *Miliolina trigonula*, but differs from it in the surface of the shell being marked by closely set, regular, longitudinal costæ. Only two specimens were obtained. They were from gatherings taken a few miles apart. The size is small, and the surface ornamentation consists of faint longitudinal lines. New to Britain.

Miliolina subrotunda, *Montagu, sp. var.* (Pl. xxvi. fig. 5, *a*, *b*.)

Vermiculum subrotundum, Montagu, 1803, Test. Brit., part 2, p. 521.

This variety differs from the typical *Miliolina subrotunda* in having the peripheral edge ornamented with somewhat irregular, oblique costæ. Frequent in shallow water gatherings.

Hyperammina arborescens, *Norman, sp.* (Pl. xxvi. fig. 1.)

Psammatodendron arborescens (Norman MS.), Brady, 1881, Denkschr. d. K. Akad. Wiss. Wien, vol. xliii., p. 98, No. 13.

Mr. Brady* thus refers to this species:—"This interesting form was discovered by the Rev. A. M. Norman growing on a polyzoan (*Menipea ternata*), dredged during the cruise of the "Valorous" off Holstenborg, Greenland, at the depth of 20 fathoms, and the name *Psammatodendron arborescens* was first assigned to it. The original specimen figured in Plate XXVIII. was most kindly lent to me by Mr. Norman when it was the only known example that was even approximately perfect. Quite recently, however, the species has been found in some abundance by Mr. David Robertson, off Cumbrae, on the west coast of Scotland." A few years ago I found a fragment of it in sand which had been dredged by Mr. James Wright off Portrush, County Antrim. Three other localities, given in the "Challenger" Report, complete the list of places where the species has been found. Mr. Brady, however, adds—"It is not improbable that when it is sought for it may turn out a very common species." It has been found in the four "Protector" gatherings, and was abundant in two of them.

Ammodiscus Shoneanus. *Siddall, sp.*

Trochammina Shoneana, Siddall, 1878, Proc. Chester Soc. Nat. Sci., part 2, p. 46, figs. 1, 2.

This species has been found at only a few places, and, excepting at Rockport, where a good many specimens were gathered, is very rare where it occurs. It was first found in the Dee (Siddall), afterwards at Rockport, Belfast Lough (Malcomson), Killybegs Harbour, Donegal (Wright), Dublin Bay

* Report Forams. H.M.S. Challenger, p. 262.

(Balkwill and Wright). It has also been recorded from two of the "Challenger" gatherings—viz., off Christmas Harbour, Kerguelin Island, 120 fathoms, and Station 238, in the very deepest part of the Pacific, 3950 fathoms.* It is indeed remarkable that a species which, in this climate, has been only met with in shallow water and shore gatherings should, in the North Pacific, occur at such a great depth.

Placopsilina cenomana, *D'Orbigny.* (Pl. xxvi. fig. 3, *a*, *b*.)

Placopsilina cenomana, d'Orbigny, 1850, Prodr. Paleont., Vol. II., p. 185, No. 758.

One large specimen of this rare species was found by Dr. Malcomson at Rockport, between tides. The specimen figured is the only example which has been obtained in Britain.

Verneuilina polystropha, *Reuss, sp.* (Dimorphous form. Pl. xxvi. fig. 2.)

Bulimina polystropha, Reuss, 1845, Verstein. Böhm. Kreid., part 2, p. 109, pl. 22, fig. 53.

This species is of frequent occurrence around our coast. An abnormal form, in which the later chambers are arranged in a linear series, with a simple round aperture, is occasionally met with in shallow water gatherings. Mr. Brady considers it a dimorphous form of *Verneuilina polystropha.*

Spiroplecta biformis, *Parker and Jones, sp.*

Textularia agglutinans var. biformis, Parker and Jones, 1864, Phil. Trans., Vol. clv., p. 370, pl. 15, figs. 23, 24.

A few years ago this species was found for the first time in British water by Dr. Malcomson, who obtained several good typical specimens at Rockport.† A few specimens have since been found in Dublin Bay (Balkwill and Wright).

Lagena semilineata, *Nov. sp.* (Pl. xxvi. fig. 7.)

Test flask-shaped, with a long, ectosolenian neck, the lower extremity furnished with a short projecting neck; upper portion of the body of the shell usually smooth; lower portion ornamented with very numerous, closely-set, longitudinal sulci; neck marked with longitudinal lines, which occasionally extend a little way down the shell.

This very elegant form may be readily distinguished from *L. semistriata* by the ornament on the lower portion being closely-set, longitudinal sulci, instead of the strong costate ribs of the latter species. It has been found at only a few localities, and is rare where it occurs.

Lagena bicarinata, *Terquem, sp.* (Pl. xxvi. fig. 8, *a*, *b*.)

Fissurina bicarinata, Terquem, 1882, Mém. Soc. Géol. France, Ser. 3, Vol. ii., Mem. iii., p. 31, pl. 1, fig. 24, *a*, *b*.

Professor Williamson, in his Monograph, has figured, under the name of

* Report Forams. H.M.S. Challenger, p. 335.

† See woodcut, Trans. Roy. Ir. Academy (Science), Vol. xxviii., p. 333.

Lagena quadrata (pl. 1, figs. 27, 28), two distinct species. Fig. 27 is an oblong form of *L. lævigata*, and this variety is known by Williamson's name; fig. 28 is *L. bicarinata*. Both species are often met with around our coast.

Lagena marginata var. inæquilateralis, *Nov.* (Pl. xxvi. fig. 10, *a*, b, *c*)

This curious variety of *L. marginata* has one side strongly convex, the other side being flattened, or slightly concave; aperture at the flattened side. Rare. Common in a fossil state in the Estuarine Clay, Limavady Junction.

Spirillina margaritifera, *Williamson.* (Pl. xxvi., fig. 12, *a—b.*)

Spirillina margaritifera, Williamson, 1858, Rec. For. Gr. Br. p. 9, pl. vii. figs. 2—4.

The following is Professor Williamson's description of this species, the type in brackets being additions of mine:—"Shell consisting of numerous narrow, somewhat convex, (?) convolutions—the outer one smooth, the inner one obscured by numerous projecting tubercles, arranged in one or two series; In some parts these are most conspicuous along the centre of the convolution; in others along the spiral septal line" [peripheral edge square]. "Texture hyaline, diam., $\frac{1}{50}$."

Williamson (*loc. cit.*) describes the convolutions of this species as convex. A somewhat similar form, differing only in the convolutions being square, has been found at several localities around our coast, and so closely does his description and illustration agree with these specimens, that I have no hesitation in considering them the same. The specimens recorded as *Spirillina tuberculata*, both by Siddall, in "Memoir on the Foraminifera of the Estuary of the Dee," and by Balkwill and myself, in "Foraminifera of Dublin Bay and Irish Sea," should, I feel satisfied, be referred to *S. margaritifera*, and *S. tuberculata* should be no longer included among the British species. *S. margaritifera* differs from *S. tuberculata* in the outer convolutions being smooth, the peripheral edge square, and the tubercules being stronger, and not so numerous.

TABLE SHOWING THE DISTRIBUTION OF FORAMINIFERA OFF BELFAST LOUGH.

ABBREVIATIONS:—v r, very rare; r, rare; c, common; v c, very common; *, previously recorded.

LIST OF SPECIES.	2 miles S. of Maiden L.H., 60 fms.	5 miles S.S.E. of Maiden L.H., 60 fms.	4 miles E. of Gobbins, 60 fms.	6 miles S.S.E. of Black Head, 30 fms.	Rockport,—Between tides.	Recent Foraminifera of Down and Antrim, 1877.
Biloculina ringens (*Lamk.*)	r	c	c	f	r	*
depressa, *d'Orb.*	f	c	c	c	r	*
Spiroloculina limbata, *d'Orb.*	f	f	f	f	...	*
planulata (*Lamk.*)	...	...	...	...	f	*
Miliolina trigonula (*Lamk.*)	r	f	f	f	r	*
insignis, *Brady*	...	vr	vr	...	...	...
tricarinata, *d'Orb.*	...	r	r	..	r	*
oblonga (*Montagu*)	...	r	r	vr	vc	*
seminulum (*Linn.*)	r	f	f	f	vc	*
tenuis (*Czjzek*)	vr	r	r	...	...	...
subrotunda (*Montagu*)	c	vc	vc	vc	vc	*
var.	vr	...	...	...	...	...
secans (*d'Orb.*)	...	...	...	vr	vc	*
bicornis (*W. & J.*)	f	c	c	f	c	*
Ferussacii (*d'Orb.*)	r	r	r	r	f	*
var. near M. sclerotica, *Karrer* ...	...	...	...	...	vc	...
pulchella (*d'Orb.*)	...	...	...	...	...	*
fusca (*Brady*)	...	...	...	...	c	*
Ophthalmidium carinatum, *Balkwill & Wright*	c	c	c	r	...	...
Cornuspira involvens (*Rss.*)	r	f	f	r	c	*
Hyperammina arborescens (*Norman*) ...	r	vc	vc	r	...	...
Reophax fusiformis (*Will.*)	...	...	...	...	...	*
sp., ...	c	r	r	r	...	...
Haplophragmium glomeratum (*Brady*) ...	...	...	vr	vr	...	...
globigeriniforme (*P. & J.*)	c	c	c	c	...	*
pseudospirale (*Will.*)	...	...	...	...	...	*
canariense (*d'Orb.*)	c	c	c	c	vc	*

TABLE—*Continued.*

LIST OF SPECIES.	2 miles S. of Maiden L.H., 60 fms.	5 miles S.S.E. of Maiden L.H., 60 fms.	4 miles E. of Gobbins, 60 fms.	6 miles S.S.E. of Black Head, 30 fms.	Rockport,—Between tides.	Recent Foraminifera of Down and Antrim, 1877.
Ammodiscus incertus (*d'Orb.*)	...	vr	vr	...	...	*
gordialis (*J. & P.*)	c	c	c	r	...	*
charoides (*J. & P.*)	vr	vr	vr	...	...	...
Shoneanus, *Siddall*	...	...	...	...	r	...
Placopsilina cenomana, *d'Orb.*	...	...	...	...	vr	...
Trochammina squamata, *J. & P.* ...	f	f	f	c	...	*
inflata (*Montagu*)	...	...	...	...	c	*
macrescens, *Brady*	...	...	...	...	r	*
Textularia sagittula, *Defrance*	r	r	r	f	...	*
gramen, *d'Orb.*	c	c	c	c	r	...
agglutinans, *d'Orb.*	vr	vr	vr	...	...	*
Valvulina fusca (*Will.*)	...	vr	...	...	...	...
Verneuilina polystropha (*Rss.*)	...	r	r	...	vc	*
dimorphous form	...	...	...	...	r	...
Spiroplecta biformis (*P. & J.*)	...	...	...	...	vr	...
Gaudryina filiformis, *Berthelin*	...	...	...	...	c	...
Bulimina pupoides, *d'Orb.*	r	r	r	r	vc	*
marginata, *d'Orb.*	vr	r	r	r	vc	*
ovata, *d'Orb.*	r	f	f	vr	c	*
elegantissima, *d'Orb.*	r	r	r	vr	c	*
subteres, *Brady*	...	vr	...	...	...	...
Virgulina Schreibersiana, *Czjzek*	..	vr	...	...	c	*
Bolivina textilarioides, *Rss.*	r	r	r	...	...	...
punctata, *d'Orb.*	r	r	r	r	c	*
plicata, *d'Orb.*	r	r	r	r	vc	*
dilatata, *Rss.*	r	r	r	...	c	*
difformis (*Will.*)	c	c	c	c	c	*
Cassidulina lævigata, *d'Orb.*	r	c	c	f	r	*
crassa, *d'Orb.*	c	f	f	...	c	*
Lagena globosa (*Montagu*)	r	r	r	r	r	*
apiculata, *Rss.*	...	...	vr	...	...	...
lineata (*Will.*)	r	f	f	f	c	*
lævis (*Montagu*)	r	f	f	r	vc	*
aspera, *Rss.*	...	...	...	...	vr	*
hispida, *Rss.*	...	...	f	...	...	*
striata (*d'Orb.*)	...	r	r	r	vc	*

TABLE—*Continued.*

LIST OF SPECIES.	2 miles S. of Maiden L.H., 60 fms.	5 miles S.S.E. of Maiden L.H., 60 fms.	4 miles E. of Gobbins, 60 fms.	6 miles S.S.E. of Black Head, 30 fms.	Rockport,—Between tides.	Recent Foraminifera of Down and Antrim, 1877.
Lagena gracilis, *Will.*	...	..	...	...	c	...
sulcata (*W. & J.*)	f	c	c	c	vc	*
costata (*Will.*)	f	vc	vc	c	r	*
Williamsoni (*Alcock*)	c	c	c	c	vc	*
semistriata, *Will.*	r	r	r	r	f	*
striato-punctata, *P. & J.*	...	...	...	...	...	*
squamosa (*Montagu*)	f	vc	vc	c	f	*
melo (*d'Orb.*)	...	r	vr	...	r	...
hexagono (*Will.*)	r	c	c	f	f	*
lævigata (*Rss.*)	r	r	r	r	c	*
var. quadrata (*Will.*)	r	vr	vr	...	...	...
marginata (*W. & J.*)	r	r	r	r	...	*
var. inæquilateralis, nov.	vr	vr	...	...	...	...
lagenoides (*Will.*)	r	r	r	...	...	*
Orbignyana (*Seg.*)	c	c	c	c	vc	...
bicarinata (*Terquem*)	...	r	r	..	...	...
pulchella, *Brady*	...	vr	...	...	vr	*
Nodosaria scalaris (*Batsch*)	...	r	r	...	r	*
pyrula, *d Orb.*	vr	r	r	vr	r	*
(D.) communis (*d'Orb.*)	vr	vr	vr	vr	...	*
(D.) obliqua (*Linn.*)	...	r	...	...	vr	*
Lingulina carinata, *d'Orb.*	vr	...	..	...	...	...
Vaginulina legumen (*Linn.*)	...	...	...	...	r	*
linearis (*Montagu*)	...	r	r	r	...	*
Cristellaria rotulata, *Lamk.*	vr	vr	...	r	vc	*
cultrata (*Montfort*)	..	...	...	...	vr	...
crepidula (*F. & M.*)	r	r	r	r	r	*
Polymorphina lactea (*W. & J.*)	r	r	r	f	f	*
var. oblonga, *Will.*	r	r	r	r	...	*
gibba (*d'Orb.*)	f	r	r	r	f	*
fistulose form	...	r	r	...	...	*
lanceolata, *Rss.*	...	...	...	r	...	...
compressa, *d'Orb.*	...	r	r	...	c	*
rotundata (*Bornemann*)	vc	vc	vc	c	...	...
concava, *Will.*	...	...	...	...	...	*
myristiformis, *Will.*	...	...	...	vr	vr	*

TABLE—*Continued.*

LIST OF SPECIES.	2 miles S. of Maiden L.H., 60 fms.	5 miles S.S.E. of Maiden L.H., 60 fms.	4 miles E. of Gobbins, 60 fms.	6 miles S.S.E. of Black Head, 30 fms.	Rockport,—Between tides.	Recent Foraminifera of Down and Antrim, 1877.
Uvigerina angulosa, *Will.*	vr	r	r	r	c	*
Globigerina bulloides, *d'Orb.*	c	c	c	c	vc	*
inflata, *d'Orb.*	...	f	f	f	f	...
Orbulina universa, *d'Orb.*	r	r	r	...	...	*
Spirillina vivipara, *Ehrenb.*	c	r	r	f	vr	*
Patellina corrugata, *Will.*	f	f	f	f	r	*
Discorbina rosacea (*d'Orb.*)	vr	...	...	vr	vc	*
globularis (*d'Orb.*)	vc	vc	vc	vc	vc	*
orbicularis (*Terquem*)	...	...	...	...	f	...
Bertheloti (*d' Orb.*)	r	r	...	r	vr	...
Wrightii, *Brady*	vr	...	...	r	...	...
Parisiensis, *d'Orb.*	...	...	...	...	vr	*
Planorbulina Mediterranensis, *d'Orb.* ...	r	f	f	f	r	*
Truncatulina lobatula (*W. & J.*)	vc	vc	vc	vc	vc	*
refulgens (*Montfort*)	..	vr	vr	...	...	*
Ungeriana (*d' Orb.*)	...	...	...	...	f	...
Pulvinulina auricula (*F. & M.*)	vr	r	r	vr	r	*
Karsteni (*Rss.*)	...	vr	vr	...	...	...
repanda (*F. & M.*)	vr	vr	vr	...	...	*
Patagonica (*d'Orb.*)	vr	vr	vr	vr	vr	...
Rotalia Beccarii (*Linn.*)	r	f	f	c	vc	*
nitida, *Will.*	f	f	f	f	vc	*
Gypsina vesicularis (*P. & J.*)	..	...	...	vr	vr	*
inhærens (*Schultze*)	...	vr	vr	r	c	*
Nonionina turgida (*Will.*)	...	...	...	...	vr	*
scapha (*F. & M.*)	...	f	f	...	...	*
umbilicatula (*Montagu*)	...	vr	...	...	...	*
pauperata, *Balkwill & Wright*	f	vr	vr	r	f	...
depressula (*W. & J.*)	f	f	f	c	vc	*
stelligera, *d' Orb.*	...	r	r	vr	vr	...
Polystomella crispa (*Linn.*)	...	r	r	r	c	*
striato-punctata (*F. & M.*)	f	c	c	vc	vc	*
Operculina ammonoides (*Gronov.*)... ...	...	...	...	...	...	*

Jaculella acuta, *Brady*, off Maiden L.H., 60-72 fms.
Lagena semilineata, *Nov.*, Newcastle, between tides, &c.
Spirillina margaritifera, *Will.*, Portrush, between tides.

EXPLANATION OF PLATE XXVI.

Fig 1. *Hyperammina arborescens* (Norman). x 30 diam.

,, 2. *Verneuilina polystropha* (Rs.). dimorphous form, x 75 diam.

,, 3. *Placopsilina cenomana*, d'Orb. *a*, inferior aspect; *b*, superior aspect, x 40 diam.

,, 4. *Miliolina insignis*, Brady. *a*, lateral aspect; *b*, oral aspect, x 75 diam.

,, 5. *Miliolina subrotunda* (Montagu), var. *a*, lateral aspect; *b*, oral aspect. x 50 diam.

,, 6. *Lagena semistriata*, Will. x 75 diam.

,, 7. *Lagena semilineata*, Nov. x 75 diam.

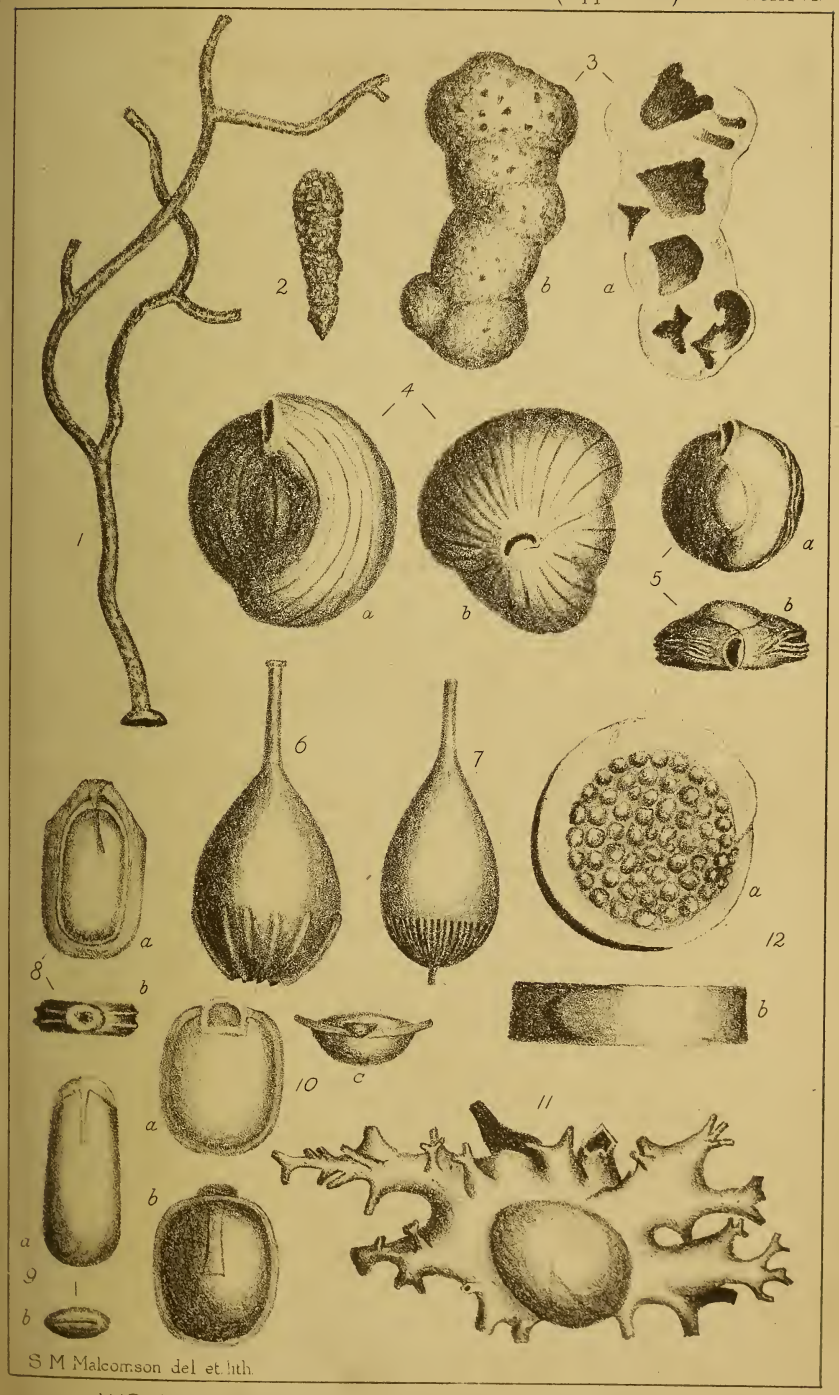
,, 8. *Lagena bicarinata* (Terquem). *a*, lateral aspect; *b*, oral aspect, x 100 diam.

,, 9. *Lagena lævigata* (Rs.), var. *quadrata*, Will. *a*, lateral aspect; *b*, oral aspect, x 100 diam.

,, 10. *Lagena marginata* (W. & J.), var. *inæquilateralis*, Nov. *a*, *b*, lateral aspects; *c*, oral aspect, x 100 diam.

,, 11. *Polymorphina gibba*, d'Orb., fistulose form, x 20 diam.

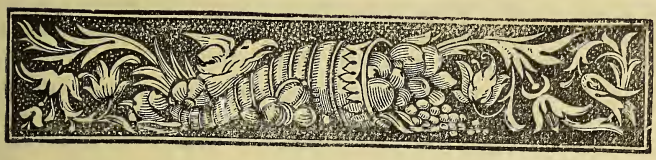
,, 12. *Spirillina margaritifera*, Will. *a*, lateral aspect; *b*, peripheral aspect, x 75 diam.



WRIGHT.—FORAMINIFERA OF BELFAST LOUGH

BRITISH MUSEUM
NATURAL HISTORY.

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1885-1886.)



A LIST OF THE CRETACEOUS FORAMINIFERA OF KEADY HILL, COUNTY DERRY.

BY JOSEPH WRIGHT, F.G.S.

IN the year 1874 I published a List of the Cretaceous Microzoa of Ireland. It was the result of three years' exploration in the chalk of the Counties of Antrim, Derry, and Down, the only counties in Ireland where rocks of this age occur. The Greensand in Ireland appears to be almost devoid of Microzoa. Only two Foraminifers have as yet been found in it—viz., *Orbitolina concava*,* and *Cristellaria rotulata*.† I have on one or two occasions examined greensand rocks under the microscope, but failed to find any trace of these organisms in them. With the above two exceptions, all the Microzoa found in the Irish Cretaceous rocks have been obtained from a mealy powder, known as chalk powder, which is of frequent occurrence in cavities in the flints. I do not remember to have ever visited a chalk exposure with flints that did not yield, on searching, at least some of this powder. At some places it was very scarce, at others it was abundant. It may have been merely accidental, but flints found in the vicinity of the sea usually contain a much greater quantity of the powder than those found farther inland.

The chalk in Ireland is a hard, compact limestone, known as white "limestone," of the same age as the soft white chalk of the South of England, but very different in character, the hardness of the Irish stone being presumably due to the heat and pressure of the overlying basalt. The flints found in it are

* Tate, Cretaceous Rocks of Ireland, Quart. Journ., Geol. Soc., 1865.

† Wright, Cretaceous Microzoa of Ireland, Rep. and Proc., Belfast Nat. Field Club, 1874, app. p. 73.

of two kinds—(1) Ordinary flints in amorphous masses, and usually lying in bands parallel with the bedding of the chalk, and having the longer axis in the plane of the bedding; (2) Paramoudras (in England known as potstones), usually of an irregular fusiform contour, variable in shape, and having a core of white limestone passing through them from end to end; they always occur in an upright position, or at right angles to the plane of the bedding, being the reverse of the position in which the other flints are found.

Most of the ordinary flints are of a homogenous, silicious structure throughout, others have incorporated with them a white limestone, and some a mealy powder. This material in flints freshly quarried is invariably hard, and in appearance similar to the white limestone in which the flints are imbedded. This soft powdery chalk seems to have been part of the ooze of the Cretaceous sea bottom, which got mixed up or entangled in flints in which silicification had been only partially completed. Thus enclosed in the flinty matrix, it was, no doubt, to a large degree protected from the influences which converted the soft chalk into a hard limestone. On exposure it becomes gradually changed into a powdery substance, and in this state the lovely Microzoa, so abundant in chalk, can be readily separated by washing.

The white chalk, as developed in Ireland, has for its base a somewhat pebbly and friable limestone, the joints and partings of which are coloured green by a superficial (glauconite ?) deposit. This bed was formerly well seen at Kilcorig, near Lisburn, and Professor Tate, who studied it at that time, has given a good account of it, especially with reference to fossils.* This glauconitic band occurs, as above stated, at Kilcorig, on the southern boundary of the Irish Cretaceous series; and on the north-west it has been found near Moneymore, and high up on the steep face of Benbradagh Mountain. The same line of escarpment is continued across Keady Hill, some nine miles to the north of Benbradagh, and in the limestone quarries at Keady there is a fine exposure of this basement bed of the white chalk. The palæontology of this portion of the chalk is most interesting. Its fossil fauna is much more varied than in any of the beds lying above, and it is much richer in the abundance of specimens which it yields.

When preparing my former paper on the Cretaceous Microzoa of the North of Ireland, I was greatly helped in the work by my friend, Mr. William Gray, M.R.I.A., who kindly procured for me chalk powder from numerous localities throughout the North of Ireland, one of them being Keady Hill. Although the quantity which I received was small, it nevertheless yielded a great variety of Foraminifera, a result to be expected, bearing in mind the great number of Mollusca and Echinoderms that have been collected from this locality; and I was sorry that I had not more material to examine. Some years later I visited the quarries, in company with two members of the Belfast Naturalists' Field Club, and collected several pounds weight of the material, which occurs there in

* Quart. Jour. Geol. Soc., 1865.

quantity. The following is a List of the Foraminifera found. Twenty-seven of the species are additions to the Cretaceous Fauna of Ireland, three of which are new to Science.

To my friend, Professor T. Rupert Jones, F.R.S., I am deeply indebted for kind assistance in helping me in the identification of some of the critical species, and also to my friend, S. M. Malcomson, M.D., for the very accurate and artistic figures which accompany this paper.

Species marked * are new to the Cretaceous Fauna of Ireland.

FORAMINIFERA (RETICULARIA).

LITUOLIDÆ.

Haplostiche clavulina, *Rss.* Rare.

***Thurammina** papillata, *Brady.* Pl. xxvii. fig. 12. Rare.

Ammodiscus incertus (*d'Orb.*). Rare.

Haplophragmium inflatum, *Rss.* Very rare.

TEXTULARIDÆ.

Textularia gibbosa, *d'Orb.* Rare.

pupa, *Rss.* Rare.
sagittula, *Defrance.* Common
eximia, *d'Eichwald.* Frequent.
turris, *d'Orb.* Rare.
globulosa, *Ehr.* Rare.
*conulus, *Reuss.* Bohm. Kreid., pl. xiii. fig. 75; near *Text. globulosa*, but more compact. Frequent.

Verneuilina triquetra (*Münster*). Rather rare.

*spinulosa, *Rss.* Frequent.

Tritaxia triquetra (*Münster*). Rather rare.

Spiroplecta prælonga (*Rss.*). Pl. xxvii. fig. 3. Rare.

Gaudryina rugosa, *d'Orb.* Frequent.

*Jonesiana, *sp. Nov.* Pl. xxvii. figs. 1, 2. Test elongate, tapering, somewhat compressed, quadrilateral; tri-serial portion, edges carinate and faces flat or slightly concave; biserial portion quadrilateral, the four angles more or less carinate, lateral faces concave, peripheral edge square, occasionally keeled from the carinate edge of the triserial portion extending up the shell; in the specimen figured the keel is not connected with the triserial part. I have pleasure in naming this species after my friend, Professor T. Rupert Jones, F.R.S. Rare.

***Clavulina** angularis, *d Orb.* One specimen.

Bulimina Presli, *Rss.* Frequent.

affinis, *d'Orb.* Frequent.

brevis, *d'Orb.* Frequent.

intermedia, *Rss.* Rare.

*Buchiana, *d'Orb.* Rare.

Virgulina tegulata, *Rss.* Var. Common.

***Bolivina** obsoleta (*Eley.*). Rather rare.

decorata, *Jones MS.* Pl. xxvii. figs. 7, 8. Test elongate, compressed broad at the oral end, and tapering to a rounded point at the aboral extremity; surface ornamented with prominent oblong tubercles which are arranged in oblique rows. Common.

Pleurostomella fusiformis, *Rss.* Rare.

LAGENIDÆ.

***Lagena** globosa (*Montf.*). Rather rare.

apiculata, *Rss.* Rare.

sulcata (*W. and J.*). Rather rare.

*gracilis, *Will.* One specimen.

***Nodosaria** (Glandulina) lævigata, *d'Orb.* Very rare.

*(Glandulina) obliquilimbata, *sp. Nov.*, *Jones MS.* Pl. xxvii. fig. 5. Test elongate, with oblique limbate sutures. One specimen.

glabra, *d'Orb.*, and dentaline variety. Rather rare.

radicula (*Linn.*). Rather rare.

.. var., near *N. conferta.* Very rare.

hispida, *d'Orb.* Rare.

(D.) farcimen (*Sold.*), var. Lorneiana, *d'Orb.* Rare.

.. exquisitely delicate variety. Rare.

(D.) consobrina, *d'Orb*, var. irregularis, *d'Orb.* Rare.

.. var. emaciata, *Rss.* Very rare.

(D.) soluta, *Rss.* Very rare.

.. var. Lilli, *Rss.* Rare.

(D.) nodosa, *d'Orb.*, var. Rare.

(D.) pauperata, *d'Orb.* Common.

(D.) communis, *d'Orb.* Frequent.

acicula, *Lamk.* Rather rare.

Zippei, *Rss.*, var. alternata, *var. Nov. Jones MS.* Pl. xxvii. fig. 10. This variety has ribs of normal character, alternating with lines of interrupted costæ. Very rare.

raphanus (*Linn.*). Rather rare.

.. var. inflata, *Rss.* Frequent.

.. short, coarse variety. Common.

Frondicularia striatula, *Rss.* Frequent.
angustata, *Nilsson.* Rare.
Archiaciana, *d'Orb.* Rare.
elliptica (*Nilsson*). Very rare.
mucronata, *Rss.*, var. Rather rare.

***Rhabdogonium** excavatum, *Rss.* One specimen.

Marginulina costata (*Batsch*). Rare.
*Reussiana, *sp. Nov. Jones MS.* Pl. xxvii. fig. 6. A very fine smooth *Marginulina*, with the later segments elongated in a linear series. Frequent.

***Vaginulina** legumen (*Linn.*). Rare.
trilobata, *d'Orb.* Frequent.
*Bronni (*Roemer*). One specimen.
costulata, *Rss.* Very rare.

Cristellaria acutauricularis (*F. and M.*). Rare.
italica, *Defrance.* Specimens very fine. Rather rare.
triangularis, *d'Orb.* Rare.
rotulata (*Lamk.*). Abundant.
*cultrata (*Montf.*). One specimen.
*crepidula (*F. and M.*). Pl. xxvii. fig. 4. One very fine specimen.
*simplex, *d'Orb.* Rare.
recta, *d'Orb.* Rare.
*cymboides, *d'Orb.* Rare.
ornata (*Rss.*). Very rare.

Flabellina pulchra, *d'Orb.* Very rare.
.. smooth variety, with parallel sides. Very rare
reticulata, *Rss.* Common.

***Polymorphina** gibba, *d'Orb.* Rare.
.. fistulose form. Rare.
fusiformis, *Roemer.* Frequent.
.. fistulose form. Rare.
*cylindrica, *Borneman.* Frequent.
regina, *B. P. and J.*, var. Pl. xxvii. fig. 14. Rare.
.. *fistulose form. Pl. xxvii. fig. 13. One specimen.

Sagrina nodosa, *P. and J.* Frequent.

Ramulina brachiata, *Jones.* Rare.
lævis, *Jones.* Rare.
*aculeata (*d'Orb.*). Pl. xxvii. fig. 11. Rare.

Globigerina bulloides, *d'Orb.* Rare.

... heaped variety. Rather rare.

cretacea, *d'Orb.* Abundant.

marginata, *Rss.* Rare.

*æquilateralis, *Br.* Pl. xxvii. fig. 9. Frequent.

***Orbulina** universa, *d'Orb.* Rare.

***Pullenia** sphæroides (*d'Orb.*). Rare.

quinqueloba, *Rss.* Rather rare.

Planorbulina exsculpta, *Rss.* Frequent.

crenulata (*Rss.*). Rather rare.

Truncatulina lobatula (*W. and J.*). Frequent.

Planorbulina ammonoides, *Rss.* Abundant.

.. var., with extra shell growth. Abundant.

Pulvinulina Micheliniana, *d'Orb.* Frequent.

Rotalia orbicularis (*d'Orb.*), var. Abundant.

*Beccarii (*Linn.*). Pl. xxvii. fig. 15. Rare.

EXPLANATION OF PLATE XXVII.

Fig. 1. *Gaudryina Jonesiana*, Nov. *a*, lateral aspect; *b*, oral aspect; x, 40 diam.

,, 2. *Gaudryina Jonesiana*, Nov. *a*, peripheral aspect; x, 40 diam.

,, 3. *Spiroplecta prælonga* (Rss.). x, 60 diam.

,, 4. *Cristellaria crepidula* (F. and M.). *a*, lateral aspect; *b*, oral aspect; x, 20 diam.

,, 5. *Nodosaria* (*Glandulina*) *obliquilimbata*, Nov., Jones MS. *a*, lateral aspect; *b*, oral aspect; x, 20 diam.

,, 6. *Marginulina Reussiana*, Nov., Jones MS. *a*, lateral aspect; *b*, oral aspect; x, 20 diam.

,, 7. *Bolivina decorata*, Jones MS. x, 60 diam.

,, 8. *Bolivina decorata*, Jones MS. *a*, lateral aspect; *b*, oral aspect; x, 60 diam.

,, 9. *Globigerina æquilateralis*, Br. *a*, lateral aspect; *b*, oral aspect; x, 60 diam.

,, 10. *Nodosaria Zippei*, Rss., *var. alternata*, Nov., Jones MS. x, 30 diam.

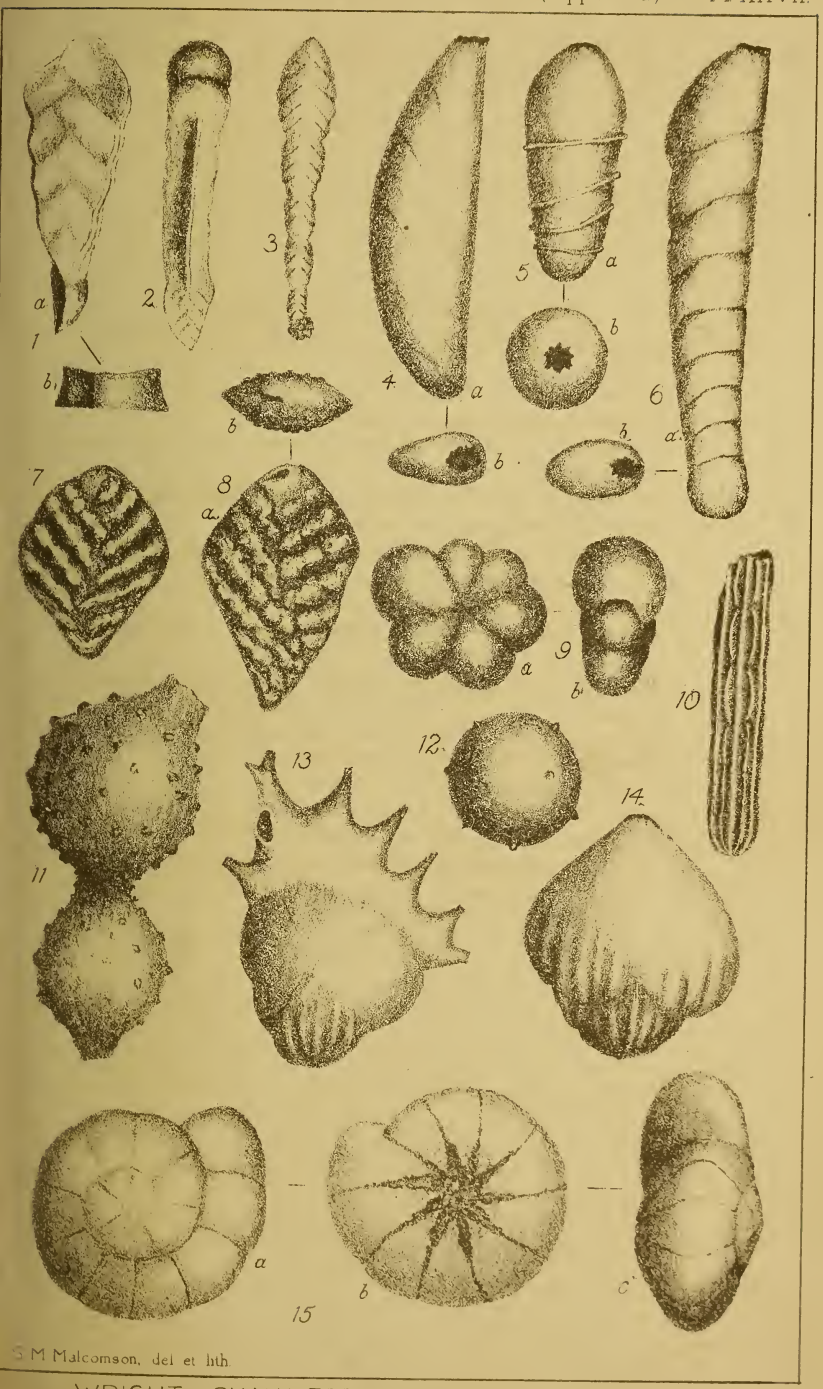
,, 11. *Ramulina aculeata* (d'Orb.). x, 30 diam.

,, 12. *Thurammina papillata*, Br. x, 60 diam.

,, 13. *Polymorphina regina*, B. P. and J., var. fistulose form. x, 40 diam.

,, 14. *Polymorphina regina*, B. P. and J., var. x, 60 diam.

,, 15. *Rotalia Beccarii* (Linn.). *a*, superior aspect; *b*, inferior aspect; *c*, oral aspect; x, 40 diam.



WRIGHT_ CHALK FORAMINIFERA_ KEADY HILL.

BRITISH MUSEUM
NATURAL HISTORY

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1884-85.)

EBRATUM.—The following 10 pages should bear the folios 335 to 344.

A LIST OF IRISH COLEOPTERA COLLECTED MAINLY BY THE LATE ROBERT PATTERSON, ESQ., F.R.S., IN THE YEAR 1829.

THE following list has been prepared from the manuscript catalogue of a cabinet of Coleoptera now in the possession of the family, and formerly the property of the late Mr. Patterson.

The collection referred to was made in the year 1829. Some of the specimens were received from other well known naturalists, but by far the greater number were personally collected by Mr. Patterson himself in the North of Ireland. It is fortunate for the purpose of the present compilation that this MS. catalogue was prepared with the accuracy and precision that characterised all Mr. Patterson's work. Except in a very few instances, the date and locality of every capture has been given; and where the specimen has been acquired from any other entomologist it is so stated, and also whether such are Irish or English. As we are here only concerned with Irish localities, we do not record those species to which English *habitats* alone are assigned, nor any of those whose names appear in the manuscript, but are not localised.

In connection with the series of local lists issued by the Belfast Naturalists' Field Club, it is considered that the present may be a useful contribution. It is also rendered of more value by the fact that so few lists of Irish insects have hitherto been published. Further, it may be hoped that this list will be favourably received from the fact that it records the early work of some of the pioneers of natural science in the North of Ireland, and founders of the Belfast Natural History Society. Anything connected with the names of Templeton, Drummond, Patterson, Haliday, or Hyndman will be of interest to the naturalists of the present day, and still more to those who may succeed them. A review of

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the work here summarised should also act as a stimulus to our youthful members. It will be seen how much could be accomplished in a year by one quite young, and fully occupied in business matters. This, too, at a time when books of reference were much less accessible than at present.

The classification of the following catalogue is that of Stephens's Systematic List of British Insects.

ABBREVIATIONS:—A. H. H.—A. H. Haliday,* F.L.S.; G. C. H.—Geo. C. Hyndman; R. T.—Robert Templeton.

SCARITIDÆ.

Clivina fossor.
Sand pit, Cranmore; under a stone, Rostrevor Mountain.—R. T.

Dyschirius politus.
Cranmore.

CARABIDÆ.

Cychrus rostratus.
Mourne Mountains.—Mr. Drummond.

Carabus catenulatus.
Rostrevor Mountain, near the summit.—R. T.

C. cancellatus.
Lurgan; under a stone near M'Swine's Gun, Horn Head, Co. Donegal—R. T.

C. glabratus.
Slieve Donard, on the open part of the heath.

Helobia brevicollis.
Sand pit, Cranmore; under stones, Horn Head.—R. T.

Leistus fulvibarbis.
Cranmore.

HARPALIDÆ.

Loricea pilicornis.
Shore of Lough Neagh, near Shane's Castle.

Chlæius nigricornis.
Irish—from A. H. H.

Anchomenus prasinus.
Shore of Lough Neagh, near Shane's Castle.

A. albipes.
With the preceding species.

A. oblongus.
Cranmore, among corn.

Platynus angusticollis.
In the cellar of our house.

Agonum marginatum.
Lough Neagh; under stones, near the mouth of the Sixmilewater.

A. parumpunctatum.
Shore of Lough Neagh, near Shane's Castle.

*Note—In Appendix VIII., p. 211. A. L. Haliday should be A. H. Haliday.

Odontonyx rotundatus.
Horn Head, Co. Donegal.—R. T.

Synuchus vivalis.
Under stones, Rostrevor Mountain.

Calathus melanocephalus.
With the preceding.

C. cisteiloides.
With the two last species.

Platyderes erythropus.
Cranmore; Moyntuagh Bogs.

Pœcilus cupreus.
Among corn at Cranmore.

P. rufifemoratus.
Cranmore. Common.

P. versicolor.
In Mr. Brownlow's demesne at Lurgan.

Omaseus Bulwerii.
Rostrevor Mountain.

O. nigrita.
Under stones, near Ardglass.

O. melanurius.
Rostrevor Mountain. Very common.

Steropus madidus.
Very common.

Stomis pumicatus.
Lough Neagh.

Patrobus rufipes.
Horn Head.—R. T.; under stones, Rostrevor Mountain.

Platysma niger.
Tollymore Park; mountains at Rostrevor.

Abax striola.
Tollymore Park.

Amara eurynota.
Under stones, near Ardglass.

A. communis.
Castlewellan; Moyntuagh Bogs.

A. familiaris.
Among corn at Cranmore.

Bradytus apricarius.
Under stones, Castlewellan; among corn, Cranmore; Moyntuagh Bogs.

Harpalus ruficornis.
Tollymore Park.

Trechus minutus (aquaticus).
Moyntuagh Bogs, under stones.

Tachys obtusus.
Cranmore, among corn.

Philocthes fuscipes ?
Among corn at Cranmore.

BEMBIDIIDÆ.

Peryphus femoratus.
Castlewellan, under stones ; shore of Lough Neagh, near Shane's Castle

P. viridi-æneus.
With the preceding.

Tachypus Andreæ.
Shore of Lough Neagh.

T. striatus.
Shore of Lough Neagh.

T. properans.
Among corn at Cranmore.

***Bembidium paludosum.**
Shore of Lough Neagh, near Shane's Castle.

ELAPHRIDÆ.

Notiophiius aquaticus.
Slieve Donard, under stones.

N. biguttatus.
Horn Head, Co. Donegal.—R. T.

Elephras cupreus.
Irish—from Mr. Haliday.

E. riparius.
Lough Neagh at Shane's Castle, among sand, gravel and short grass, near the water's edge.

Blethisa borealis.
Lough Neagh. Given to me by Mr. Haliday, who had not before seen any indigenous specimens.

DYTICIDÆ.

Haliplus ferrugineus.
Irish—from Mr. Haliday.

Hygrotus scitulus.
Moyntuagh Bogs, on roots and stems of aquatic plants.

H. pictus.
With the preceding.

Hydroporus dorsalis ?
With the two last named species.

* The first specimen of this species found in Ireland.

Noterus crassicornis.
Moyntuagh Bogs, with the preceding.

Colymbetes fuliginosus.
Common in the ponds at Cranmore.

C. bipustulatus.
In a pond in the fort-field at Moira.

Dyticus marginalis.
Irish—from G. C. H.

D. punctulatus.
Common in the ponds at Cranmore.

Acilius sulcatus.
Moira, bog hole in the fort-field.

GYRINIDÆ.

Gyrinus natator.
Cranmore, common in the ponds.

LIMNIIDÆ.

Limnius æneus.
Irish—from G. C. H.

HELEPHORIDÆ.

Helephorus nubilus.
Cranmore, coming out of rotten wood.

HYDROPHILIDÆ.

Limnebius ater.
Irish—from A. H. H.

L. truncatellus.
Irish—from A. H. H.

SPHÆRIDIIDÆ.

Cercyon sp. ?
On roots and stems of aquatic plants in Moyntuagh Bogs.

ANISOTOMIDÆ.

Orthoperus pusillus.
Irish—from A. H. H.

SILPHIDÆ.

Necrophorous vespillo.
Found in the rabbit warren, at Holywood, in 1827, by James Emerson (Sir James Emerson Tennent).

Oiceoptoma rugosa.
Irish—from A. H. H.

O. sinuata.
Shore of Lough Neagh, near Shane's Castle.

Phosphuga subrotundata.
Cranmore. Very common.

NITIDULIDÆ.

Nitidula discoidea.
Irish—from A. H. H.

N. obsoleta.
Castlewellan.

Meligethes viridescens (?)
Cranmore, in flowers.

M. urticæ (?)
Cranmore.

ENGIDÆ.

Atomaria fuscipes.
Irish—from A. H. H.

Cryptophagus caricis.
Irish—from A. H. H.

Byturus tomentosus.
Found at Cranmore, under the bark of a decayed beech tree, by R. T.

Latridius transversus.
Cranmore.

DERMESTIDÆ.

Throscus dermestoides.
Holywood, rare—from A. H. H.

BYRRHIDÆ.

Byrrhus sericeus.
Cranmore.

HISTERIDÆ.

Hister carbonarius.
Cranmore.

H. nitidulus.
Irish—from A. H. H.

GEOTRUPIDÆ.

Geotrupes sylvaticus.
County Donegal; road from Churchhill to Lough Neagh, R. T., and by the edge of Lough Neagh, R. T. Mourne Mountains (?) Mr. Drummond.

G. stercorarius.
Common.

APHODIIDÆ.

Aphodius terrestris.
Castlewellan.

A. rufipes.
Cranmore.

A. contaminatus.
Rostrevor Mountain.

MELOLONTHIDÆ.

Serica brunnea.
Irish—from A. H. H.

Melolontha vulgaris.
Cranmore, also an Irish specimen from G. C. H.

Anomala horticola.
Shane's Castle.

ELATERIDÆ.

Hemirhipus limbatus.
Cranmore.

H. marginatus.
Irish—from A. H. H.

H. obscurus.
Cranmore.

Elater cupreus (?)
Cranmore.

E. niger (?)
Cranmore.

CEBRIONEDÆ.

Atopa cervina.
Irish—from A. H. H.

CYPHONIDÆ.

Cyphon melanurus.
Irish—from A. H. H.

C. padi.
Cranmore, also an Irish specimen from A. H. H.

TELEPHORIDÆ.

Telephorus pallidus.
Cranmore.

PTINIDÆ.

Ptinus fur.
Irish—from A. H. H.

P. crenatus.
Irish—from A. H. H.

Cis sp. (?)
Castlewellan.

CURCULIONIDÆ.

Cossonus Tardii.
Cranmore. Found during the entire month of June by turning up the under side of an alder, which lay in the farm-yard, and from which the bark

had been stripped. Generally found in clusters of three and four, ranged side by side. They were not found in any other situation, though the adjoining trees were carefully examined by R. T.

Ceutorhynchus didymus.
Cranmore.

Nedyus assimilis (?)
Cranmore.

Orchestes fagi (calcar).
Cranmore.

Anthonomus fasciatus.
Castlewellan Demesne.

Notaris acridulus.
Cranmore, among corn.

Liophlæus nubilus.
Cranmore.

Otiorhynchus sulcatus.
Cranmore.

O. notatus.
Mourne Mountains.—Mr. Drummond.

Philopedon geminatus.
Cranmore.

Strophosmus coryli.
Rostrevor Mountain, on a hazel.

Polydrusus oblongus.
Cranmore.

Phyllobius parvulus.
Cranmore.

Apion hydrolapathi.
On a rhodedendron, at Cranmore.

A. flavipes.
Cranmore.

SALPINGIDÆ.

Salpingus roboris (ruficollis).
Taken under the bark of a holly in Tollymore Park.

LEPTURIDÆ.

Leptura ruficornis.
Cranmore.

CRIOCERIDÆ.

Donacia festucæ (proteus).
On rushes in the Moyntuagh Bogs.

GALERUCIDÆ.

Galeruca capreæ.
Cranmore.

Haltica exoleta.
Cranmore, among corn.

H. dentipes (concinna).
Cranmore, among corn.

CHRYSOMELIDÆ.

Chrysomela cochleariæ.
Castlewellan.

C. polygoni.
Cranmore.

C. raphani.
On Slieve Croob, about small pools of water.

C. polita.
Under stones on the beach, near Shane's Castle.

COCCINELLIDÆ.

Coccinella tredecimpunctata.
Cranmore.

BLAPSIDÆ.

Blaps mortisago.
In our shop, crawling up the wall, also in our cellar.

MORDELLIDÆ.

Anaspis ruficollis.
Cranmore.

CANTHARIDÆ.

Proscarabeus violaceus.
Near Holywood.—From A. H. H.

TACHYPORIDÆ.

Bolitobius atricapillus.
Tollymore Park, on a wall.

Tachinus marginellus.
Slieve Donard.

T. pullus.
Lough Neagh, at Ardmore, found by Miss Jellett.

STAPHYLINIDÆ.

Staphylinus erythropterus.
Among corn at Cranmore.

S. castanopterus.
Cranmore, and Squire's Hill.

Quedius tristis.
Cranmore, among corn.

Philonthus politus.
With the preceding.

P. marginatus.
With the two preceding species.

Gyrohypnus cruentatus.
Castlewellan.

STENIDÆ.

Pæderus riparius.
Tollymore Park.

Oxytelus cornutus.
Cranmore, among corn.

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APPENDIX I.

VOL. II.

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THE FERNS OF ULSTER.

BY WILLIAM H. PHILLIPS AND ROBERT LLOYD PRAEGER,
B.E., B.A.

NATURAL HISTORY

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The Ferns of Ulster.

By William H. Phillips and Robert Lloyd Praeger, B.E., B.A.

In submitting the following list of the species and varieties of our local Ferns to the members of the Belfast Naturalists' Field Club, we cannot but regret the absence in our district of other observers in this branch of natural science. The study of the varieties of British Ferns is most interesting and fascinating—being half botany, half horticulture, since the finds must be grown in order to be understood and correctly named—and is one which can be carried on with very little trouble or expense. Yet, beyond our own finds, we have been able only to come across a very few stray records. Thus, the counties of Armagh, Donegal, and Cavan are hardly represented at all in our localities for varieties, while the names of Antrim and Down occur in almost every line—those being the counties to which we most easily had access. This, however, only proves the richness of our district in varieties. Ferns there are, if only some one will find them. There is still a great field of discovery among our North of Ireland *Filices*. Already Ulster has yielded some splendid new varieties—among which we may mention *Athyrium Filix-fœmina crispum* and *Polystichum angulare divisilobum Crawfordiæ;* and many other treasures lie hidden away in our glens and copses only waiting to be found. At some future time we hope to bring out a supplement to this list, and we trust that then we shall have other names to record as finders of some of these beautiful varieties. The labour is small and the reward great. Nothing is more pleasant than to watch some wild find developing, under one's care, into an elegant decomposite or crested form. Again, a great advantage of Fern-hunting, as compared with most out-door scientific persuits, is that it can be carried on equally at every season of the year. For botany or entomology, for instance, there is but a short summer season; but not so among the Ferns; for while

in summer we can explore the *Athyriums* and *Lastreas* and *Blechnums* in our woods and on our mountain sides, in winter the evergreen fronds of *Polystichum* and *Scolopendrium* peep at us through the leafless hedges and wave luxuriantly in all our glens, inviting us to take up bag and trowel and go off Fern-hunting. We may add that we shall be very happy to give all the information in our power concerning this branch of botany to anyone asking it, or to name fronds sent to us, or to receive notes of new localities for species.

The district to which this list refers is bounded to the southward by the frontier line of Ulster, with the exception of the south-east and south-west corners, where in each case a slight encroachment has been made on an adjoining province. In the south-west a detour has been made in order to include the famous botanical region of Ben Bulben, in the extreme northern corner of Co. Sligo; and on the south-east our line has been drawn so as to include the Carlingford Mountains, in Co. Louth, which botanically, and in a less degree geologically, belong to the Mourne Mountains, in Co. Down. As regards the distribution of species in this area, few general observations can be made. *Asplenium marinum* and *Adiantum Capillus-Veneris* occur only along the coast line; the former being recorded from all our maritime counties, and growing in all suitable situations along our shores; the latter being confined to a limited area in Donegal.* *Polystichum angulare* haunts the low fertile districts in the east of the province, and is almost entirely unknown among the barren mountainous districts of Donegal and Fermanagh. In these latter, however, the Royal Fern, *Osmunda regalis*, occurs most plentifully, luxuriating in the rich peaty soil that surrounds the numerous lakes in those regions. *Polystichum lonchitis* and *Asplenium viride* are confined to the western counties; *Ophioglossum* loves the rich pastures of Down, Antrim, and Armagh. As Ulster plants, three of our Ferns are confined to Donegal; and it is a very strange thing that these three species, which are found only in the bleakest and most northern of all our counties, should be all southern plants. *Ophioglossum lusitanicum* is a plant of the Mediterranean coasts and the Canary Isles, whose only other British stations are Kerry and Guernsey. The Killarney Fern, *Trichomanes radicans*, principally haunts, as a British species, the shadiest rocks in the south and south-west of Ireland; and the Maidenhair, *Adiantum Capillus-Veneris*, makes its home in southern Europe and the north of Africa, occurring also on the south coast of England and in the south-west of Ireland. Some of the species, again, seem ubiquitous—*Athyrium Filix-fœmina*, *Polystichum aculeatum*, and *Lastrea Filix-mas* are examples—occurring equally in damp shady woods and glens, on open hedge-banks and roadsides, and on storm-swept mountains, where they flourish among the stones and rocks.

Of the 46 British and 33 Irish species of Ferns, our province yields 32—

* With the exception of a few plants found in Leitrim.

Asplenium lanceolatum being the only Irish Fern which does not occur in the district.* Of these 32 species, five may be accounted extremely rare, having been found in only one or two localities in the district; these are:—

Polypodium Dryopteris.
Lastrea spinulosa.
Adiantum Capillus-Veneris.
Trichomanes radicans.
Ophioglossum lusitanicum.

Five others may be called very rare, occurring as they do very sparingly in the province:—

Allosorus crispus.
Polystichum Lonchitis.
Lastrea Thelypteris.
Asplenium viride.
Hymenophyllum Tunbridgense.

Six more come under the head not common:—

Polypodium Phegopteris.
Lastrea Oreopteris.
Cystopteris fragilis.
Hymenophyllum Wilsoni.
Osmunda regalis.
Botrychium Lunaria.

Five under the head rather common:—

Lastrea æmula.
Polystichum aculeatum.
Ceterach officinarum.
Asplenium marinum.
Ophioglossum vulgatum.

And finally, eleven under the head common, being plentifully distributed through the district:—

Polypodium vulgare.
Lastrea Filix-mas.
——— *dilatata.*
Polystichum angulare.
Athyrium Filix-fœmina.
Asplenium Adiantum-nigrum.
——— *Trichomanes.*
——— *Ruta-muraria.*
Scolopendrium vulgare.
Blechnum spicant.
Pteris aquilina.

* It is confined to counties Cork and Kerry.

This grouping is, of course, only approximate, and if taken as referring to any particular county or district might give very erroneous results; but when taken as referring to Ulster as a whole, it will, we think, convey a pretty correct general idea of the distribution of our local Ferns.

In two instances—namely, when referring to *Lastrea Filix-mas* and to the divisilobe class of varieties of *Polystichum angulare*—we have departed from our course as compilers of a list in order to describe some new classification which has recently been adopted by the leading authorities on British Ferns. This is not to be found in any of our Fern manuals, and, we believe, will prove interesting to the botanists of the Club. We have been compelled, much against our will, to adopt an alphabetical arrangement of the varieties, since no scientific classification of them has been made, and we did not feel qualified to attempt this task ourselves. The British Pterodological Society performed a great service in classifying the varieties of *Polystichum angulare*, though unfortunately their results have not been published; but the *Athyriums*, *Lastreas*, and *Scolopendriums* still remain unarranged, waiting for some champion to arise to give each one its proper place in the world of Ferns.

In the difficult task of naming the varieties, we have obtained much valuable assistance from kind friends on the other side of the channel; among these we would specially mention Colonel Jones, of Bristol, and George B. Wollaston, Esq., of Chislehurst, to both of whom we are deeply indebted, both for naming fronds submitted to them, and for sending us plants and fronds of English forms of our varieties. From the beautiful nature-printed plates of varieties of British Ferns, brought out by Colonel Jones, under the auspices of the British Pterodological Society, we have abstracted our notes on *Lastrea Filix-mas* and *Polystichum angulare proliferum*, and have derived much other assistance. To Mr. S. A. Stewart, F.B.S.E., we also owe many thanks for information supplied as to localities for species.

As to the distribution of varieties very little can be said. The varieties of Ferns are peculiar, in as much as they generally occur as isolated plants. Occasionally a little colony of some variety is discovered; but usually a single plant is all that is obtained in any one place. A few of the exceptions to this rule we may mention:—

P. angulare capitatum has been known to grow in Ballygomartin Glen, near Belfast, for some twenty years; and in spite of frequent depredations, may still be found there. The *Irish Polypody* is a striking exception, as it generally occurs in considerable quantity where it occurs at all. The ditches about Ballymenoch, Holywood, have long yielded examples of *P. angulare interruptum*. On sea-cliffs near Torr Head, in Co. Antrim, this summer, we discovered a large colony of very curious interrupted forms of *Athyrium Filix-fœmina;* and many other instances might be quoted. But the most noteworthy example occurs on the Mourne Mountains, where two very interesting varieties of *Blechnum*, *trinervium* and *anomalum*, occur in hundreds on

the hill-sides; yet we have no record of either of these forms having been found in any other locality in Ulster.

In conclusion, we may say a few words as to the times at which the various observers, whose names occur in the following pages, lived and laboured in the cause of science. Mr. Templeton was the great pioneer of Ulster botany, and the accuracy and care displayed in his notes have excited the admiration of all who have followed in his wake; most of his records date between 1780 and 1810. After him came Messrs. Thompson, Whitla, and Hyndman (about 1820 to 1840), each of whom contributed his share towards the knowledge of our local flora. Other names which frequently occur in the "Flora of Ulster" (1864), from which we have extracted many notes, are those of Messrs. Ferguson, Millen, and Orr, and that of the author, Dr. Dickie. Following many of the localities in this list will be found the names of Dr. Mackay and Dr. Moore, each of whom did so much good work in the cause of Irish botany. More recent observers, whose names often occur in this list, are Messrs. S. A. Stewart, H. C. Hart, and R. M. Barrington. After each locality we have given, as far as we were able, the name of the original finder; and where the plant has been since observed there we generally mention it.

1. POLYPODIUM. POLYPODY.

1. P. VULGARE. **Common Polypody.**

Rocks, walls, trees, and woods—plentiful throughout the district. Ascends to about 1000 feet on the mountains. On summit of Ben Bulben (1721 feet), T. H. Corry.

adpressum.

Craigauntlet, Co. Down, R. Ll. P.

bifidum.

Castlereagh, Co. Down, W. H. P. and R. Ll. P. Holywood hills, Co Down, R. Ll. P.

denticulatum.

Lough Gill, Co. Sligo, Moore's N.P. Ferns. Knockagh, Co. Antrim, R. Ll. P.

rotundatum.

Near Knockmore, Co. Fermanagh, W. H. P.

semilacerum (*Irish Polypody*).

Co. Antrim.—Redhall Glen, Templeton; Glenoe and Islandmagee, B. N. F. C.; east branch of Woodburn glen, T. H. Corry; Garron Point

and Knockagh, R. Ll. P. Near Knockmore, Co. Fermanagh, W. H. P. Island in Lough Erne, Co. Donegal, T. H. Corry. Redhall and Glenoe are two well-known stations for this handsome variety, and at both it grows abundantly and luxuriantly; in the latter place we have measured fronds 1½ foot long by 9 inches broad. It is almost confined to Co. Antrim—doubtless the limestone is the attraction there, but why is it so rare in other limestone tracts?

2. P. PHEGOPTERIS. **Beech Fern.**

Not common.

Damp rocks and banks.

Ascends to over 2000 feet in the mountains. At 2400 feet on Slieve Bingian.

Antrim.—North branch of Glenarve river, Templeton, 1809. On Slievenanee, and in Glendun, Rev. S. A. Brenan. Glenariff, W. H. P., R. Ll. P., &c. By waterfall on Inver river above Glenariff, and by the Carnlough and Linford rivers, and on Trostan, R. Ll. P.

Down.—Two miles south of Slieve Croob, and on Slieve Bingian, Templeton (and later in latter station, Rev. H. W. Lett and R. Ll. P). Black mountain, above Tollymore Park, W. Thompson; (since observed there, Rev. H. W. Lett, W. H. P. and R. Ll. P.) Rostrevor, Rev. George Robinson. On Slieve Donard and Slieve Commedagh, S. A. Stewart. Luke's mountain, W.H.P. Sparingly near Craigauntlet above Holywood, and on Slieve Bearnagh, Slieve-na-glough, and Thomas mountain, R.Ll.P.

Louth.—Carlingford mountain, Robt. Browne, 1801, and since by B.N.F.C., Rev. H. W. Lett, W. H. P. and R. Ll. P.

Armagh.—Frequent on rocks on N.E. slope of Slieve Gullion, Rev. H. W. Lett.

Derry.—Ness Glen, Templeton. By the Owenrigh river, near Banagher, S. A. Stewart. Near Dungiven, B.N.F.C., 1872.

Donegal.—Lough Eske, Mackay. Near Killybegs, A. G. More. Glenalla, Carradoan, Angterlinn, Croghanmore, Poisoned Glen, Banagher mountain, Glenveigh, Alt mountain near Ardara, near Lough Finn, Milford, woods by coast between Slieve-a-tooey and Magheragh, and at 2000 feet on Slieve Snacht West, H. C. Hart. Crockaughrim, Charles Moore.

Tyrone.—Strabane Glen, W. H. P.

Fermanagh.—Near Brookeborough, Rev. S. A. Brenan.

3. P. DRYOPTERIS. **Oak Fern.**

Extremely rare.

Shady places on mountains.

Antrim.—North side of Knocklayd, Cybele Hibernica. Since a single plant of this fern was discovered by Dr. Moore in the above locality nearly half a century ago, it has not been observed in the North of Ireland, and we very much doubt if it can now be reckoned among our local ferns.

[**P. ROBERTIANUM** is reported to have been found on Carlingford Mountain, Co. Louth, but this is very unlikely, and requires ample confirmation.]

2. ALLOSORUS. ROCK-BRAKE.

1. A. CRISPUS. **Parsley Fern.**

Rocky places on mountains. Very rare.

Antrim.—Knocklayd and Carrickfergus Commons, David Moore. South brow of Slievenanee at 1500 feet, Dr. Dickie—since observed in above station by T. H. Corry and Rev. S. A. Brenan.

Down.—On Slieve Bingian, Templeton, 1808—and recently, Rev. H. W. Lett and R. Ll. P. On Shanslieve, Slieve-na-brock, and north side of Slieve Donard, Rev. H. W. Lett. Near the Eagle Rock, on the road from Hilltown to Kilkeel, Mr. Barcroft. On south side of Slieve Donard, and on the mountain north of Cove mountain, R. Ll. P.

Louth.—Carlingford mountain, very rare, B.N.F.C., 1878.

Derry.—Clontygearagh mountain, David Moore.

Donegal.—Very sparingly on Alt mountain near Ardara, H. C. Hart.

Fermanagh.—On Cuilcagh mountain near Florencecourt, John M'Donald. Very rare and scanty in the district, only isolated plants occurring here and there.

3. LASTREA.

1. L. THELYPTERIS. **Marsh Fern.**

Wet places. Very rare.

Antrim.—Plentiful about Portmore Park and wood, Templeton, 1794. Banks of Six-mile water near Ballyclare, G. C. Hyndman and F. Whitla.

Donegal.—By the river Erne near Ballyshannon, A. G. More. By the same river near Belleek, H. C. Hart.

Tyrone.—By a small lake near Caledon Rectory, Rev. G. Armstrong. At Omagh and Gorteen Gap, G. H. Kinahan.

Cavan.—Near Belturbet, David Moore.

Donegal and Tyrone are the only counties where this fern has been recently found; it is very strange how it has died out at Portmore.

2. L. OREOPTERIS. **Mountain Fern.**

Banks and mountain pastures. Not common, and very local.

Antrim.—At the base of the hill above Carrickfergus, J. Rea. Glendun, B.N.F.C., 1879—a well-known locality, where it grows in great profusion. Glenshesk, behind Ballycastle, Dr. O'Connor. Glenarm Deerpark, south side of Glenariff, at Culraney north of Runabay Head, in Glenaan, and near Cushendall, R. Ll. P.

Down.—Tollymore Park, Templeton, 1805—often since recorded from this station. Thomas mountain, W. H. P. In various places about Newcastle, W. H. P., R. Ll. P., &c. Luke's mountain, and near Moneyscalp plantation west of Bryansford, and on the Holywood hills, R. Ll. P. Very rare in last locality.

Armagh.—On Ferry Hill above Narrow Water, R. Ll. P.

Derry.—Bennedy near Dungiven, David Moore. Cushcapel near Dungiven, and on Slieve Gallion near Desertmartin, S. A. Stewart. Moyola Park at Castledawson, B.N.F.C. Mullaghmore, H. C. Hart. Lignapeiste, W. H. P.

Donegal.—Milroy Bay, Newman. Gap of Barnesmore, W. Thompson. Killybegs, and near Lough Eske, R. Barrington. Mintiagh, Charles Moore. Near Black Gap, T. H. Corry. Banks of Eske river, Glen river, Lough head river, and Reelan water, at Glenveigh and Bunlinn, and plentiful in glens in Innishowen, H. C. Hart. Near Buncrana, W. H. P.

Tyrone.—Strabane Glen, W. H. P.

Leitrim.—South side of Glenade mountain, R. Barrington and R. P. Vowell.

interrupta. Glendun, Co. Antrim, R. Ll. P.

revolvens. Newcastle, Co. Down, W. H. P.

3. L. FILIX-MAS. **Male Fern.**

It is now generally admitted that this species as described by Presl includes three distinct forms, which are elevated to the rank of species by Mr. Wollaston. We append the most obvious of their characters as briefly as possible under their several heads.

A. Propinqua-mas (*Wollaston*). (*Filix-mas abbreviata, Moore.*) (Fronds and pinnæ concave, pinnules biserrate, colour dull pale green; perfectly deciduous, texture soft; indusium embracing spore-cases, persistent, entire).

Dry hedge-banks and woods. Extremely rare.

Near Carngaver, Co. Down, R. Ll. P., 1882.

B. Filix-mas (*Presl*). (Fronds and pinnæ convex, pinnules serrate or biserrate; colour shiny pale green; texture papery; very partially deciduous; indusium not embracing spore-cases, eventually evanescent, disrupted).

Woods, glens, roadsides, &c. Common.

argentea. (Record lost), W. H. P. A white variegation.
confluens. Ligoniel, Co. Antrim, W. H. P.
flava. (Record lost), W. H. P. A yellow variegation.
interrupta. Castlereagh, Holywood, Newcastle, Cushendall, &c.—a common but inconstant variety.

C. Pseudo-mas (*Wollaston*). (*Filix-mas paleacea, Moore*). (Fronds and pinnæ plane, pinnules entire or very slightly toothed, colour bright yellowish green when young, deep shining green when mature; rachis thickly clothed with rich golden-brown scales; texture coriaceous; evergreen or sub-evergreen; indusium embracing spore-cases, persistent, entire.

Woods, hedges, and wastes. Common.

crispata. Holywood and Castlereagh, Co. Down, W. H. P. The Rock, Co. Tyrone, Rev. S. A. Brenan.
cristata. Upper Cultra Wood, Co Down, Robert Milligan—a very good find.
foliosa. Newcastle, Co. Down, W. H. P.
interrupta. Castlereagh, Holywood, Dundonald, &c.—like *Filix-mas interrupta*, a common but inconstant form.
monstrosa. Holywood, Co. Down, W. H. P. An extreme form of *interrupta*, but constant.
polydactyla. Newcastle, Co. Down, W. H. P.

4. L. DILATATA. **Broad Buckler Fern.**

Woods, rocks, hedges, &c. Abundant.

Occurring in all situations throughout the district. Of all our local ferns, this is the one which occurs at the greatest altitude on the mountains, ascending even higher than Blechnum. On the Mourne mountains, we have observed it up to over 2000 feet. At nearly 2500 on Slieve Donard.

interrupta. Holywood waterworks, Co. Down, R. Ll. P.
truncata. Holywood hills, and Dundonald, Co. Down, R. Ll. P.

5. L. SPINULOSA.

Damp shady places. Extremely rare.

Derry.—Frequent by the river Roe near Dungiven, David Moore. Dr. Moore sent specimens to England and had his find confirmed by Thomas Moore of Chelsea. This is the only record of this fern in Ulster which we consider perfectly reliable: forms of *L. Dilatata* are often mistaken for it.

6. L. ÆMULA. **Bree's Fern.**

Damp woods and hedgebanks. Generally distributed but not common. Ascends to about 1000 feet.

Antrim.—Cushendall, Moore's N.P. Ferns. Among heather at 1000 feet on the summit of Carnaneigh, and plentiful in the wood at Murlough Bay, R. Ll. P.

Down.—Slieve Donard and sandhills at Dundrum, Dr. Dickie. Rademon Demesne and near Tyrella, C. Dickson. Cultra, W. Millen, and later, W. H. P.—now extinct. Drumbo Glen, Alexander Robertson. Plentiful in Tollymore Park—a well-known station—and near the Spa, Ballynahinch, W. H. P. Near Dunbeg Lake N.W. of Ballynahinch, and sparingly near Newtownards and Dundondald, R. Ll. P.

Louth.—By the Two-Mile River on Carlingford Mountain, R. Ll. P.

Armagh.—Plentiful in the woods on Ferry Hill above Narrow Water, R. Ll. P.

Derry.—Coleraine, Moore's N. P. Ferns. Garvagh, David Moore. On an old bank inland from Portrush, W. H. P.

Donegal.—Milroy Bay, Lough Derg, Lough Swilly and Errigal Mountain, Moore's N. P. Ferns. Killybegs and Lough Eske, R. Barrington. Innishowen Head, Aran Island, and in woods near Carndonagh, and at Glenalla, Rathmullen, and Carrablagh, H. C. Hart. Buncrana, W. H. P.

Tyrone.—Strabane Glen and Sion Mills, W. H. P. Near Pomeroy, S. A. Stewart.

Fermanagh.—Near Pollaphuca, R. Barrington. Carrick and Drumbad, S. A. Stewart. Frequent in the county, W. H. P.

Cavan.—Lough Sheelin, and by the R. Erne at Lough Gowna, R. Ll. P.

Sligo.—Abundant on Ben Bulben; shores and islands of Lough Gill, W.H.P.

Leitrim.—Glencar and Glenade, R. Barrington and R. P. Vowell.

angustipinnula. Tollymore Park, Co. Down, W. H. P.

4. POLYSTICHUM. SHIELD FERN.

1. P. LONCHITIS. **Holly Fern.**

On mountains, among stones. Very rare.

Ascends to the summit of Ben Bulben (1721 feet), T. H. Corry.

Donegal.—Rosses and Fanet mountain passes,* and in a glen east of Lough Eske, David Moore. Slieve League, H. C. Hart.

Sligo.—On Ben Bulben and other mountains in County Sligo, Dr. Mackay, and later by S. A. Stewart and T. H. Corry.

Leitrim.—On the Glenade Mountains, W. H. P. Common in parts of Glenade, R. Barrington and R. P. Vowell.

2. P. ACULEATUM. **Prickly Shield Fern.**

Woods, hedgebanks, and stony places. Rather local. An upland fern.

Antrim.—Glenarm, Cushendall, &c., Templeton. Colin Glen, W. Thompson. Stoneyford, Wolfhill, Crow Glen, Lough Mourne, Woodburn, and

* "Having applied to Dr. Moore, I learn this was a mistake."—H. C. HART.

Larne, W. H. P. Glynn, Glenarm Deerpark, Glendun, Glenariff, Carnlough, Murlough Bay, and Binnagee, R. Ll. P.

Down.—Tollymore Park, W. Thompson. Rademon Demesne, Cultra, and Hillsborough, W. H. P. Rostrevor, Clandeboye Demesne, Craigauntlet, Carngaver, and Crawfordsburn, R. Ll. P.

Louth.—By the Two-Mile River on Carlingford Mountain (*lobatum* form), R. Ll. P.

Armagh.—Near Tynan, W. H. P. On Ferry Hill, above Narrow Water, R. Ll. P.

Donegal.—By the River Erne opposite Cliff, and plentiful on Crockaughrim, H. C. Hart. Mintiagh, Charles Moore.

Tyrone.—Aughnacloy, G. H. Kinahan. Dungannon, W. H. P.

Fermanagh.—Not uncommon on the hills, S. A. Stewart. Plentiful in the county, W. H. P.

Monaghan.—Near Monaghan, W. H. P.

Cavan.—Not uncommon on the hills of North Cavan, S. A. Stewart.

furcans. At Tynan, Co. Armagh, and in Co. Fermanagh, W. H. P.

gracile. Co. Fermanagh, W. H. P.

The varieties *lobatum* and *lonchitioides* are of frequent occurrence, but we do not consider them very distinct.

3. P. ANGULARE. **Soft Shield Fern.**

Woods, glens, and hedgebanks. Plentiful.

Essentially a lowland fern—excepting one isolated plant, we have never found it at over 500 feet. Our district is very rich in varieties of this species, which, on account of their complicated nature, we have found some difficulty in naming correctly.

acutum. Glendevis, Co. Antrim, W. H. P. Cultra, Co. Down, R. Ll. P.

acutilobum. See *proliferum.*

attenuato-interruptum. Glenarm, Co. Antrim, R. Ll. P.

attenuato-furcans. Cultra, Co. Down, R. Ll. P.

brachiatum. Kilroot, Co. Antrim, W. H. P.

brachiato-cristatum. Castlecoole, Co. Fermanagh, W. H. P.

brachiato-decompositum. Crow Glen, Co. Antrim, W. H. P. Stormont, and Dundonald (*Tripinnatum Praeger, Jones*), Co. Down, R. Ll. P.

capitatum. Antrim Road and Springfield, Belfast, W. H. P. Holywood, Co. Down, R. Ll. P.

capitatum (*Ramulosum, Stansfield*). Glendevis, Co. Antrim, W. Gault, and later, W. H. P. and R. Ll. P. Clandeboye, Co. Down; and Strabane Glen, Co. Tyrone, W. H. P. Cultra, Dundonald, and Stormont, Co. Down; Castle Dobbs, Co. Antrim; and Lough Sheelin, Co. Cavan, R. Ll. P.

coriaceum. Castlereagh, Co. Down; and Springfield, Belfast, W. H. P.

cristatum. Dalchoolin, Co. Down; and Kilroot, Co. Antrim, W. H. P.

Holywood, and Stormont, Co. Down; and Castle Dobbs, Co. Antrim, R. Ll. P. Stormont Demesne has yielded two, and the Castle Dobbs neighbourhood no less than three, distinct forms of this rare variety.

cuneatum. Castlereagh, Co. Down; and Castlecoole, Co. Fermanagh, W. H. P. Carngaver, Dundonald, and Craigavad, Co. Down, R. Ll. P. The Craigavad form develops into *grandidens* in a very extraordinary way.

cuneato-setosum. Cave Hill, Co. Antrim; and Castlecoole, Co. Fermanagh, W. H. P. Two elegant forms.

decompositum. Cultra, Co. Down; Castle Dobbs, Co. Antrim; and Castlecoole, Co. Fermanagh, W. H. P. Stormont, Co. Down, R. Ll. P.

decompositum densum. Stormont, Co. Down, R. Ll. P.

decurrens. Cultra, Co. Down, R. Ll. P.

deltoideum. Crow Glen, Co. Antrim, W. H. P.

dentatum. Crow Glen, Co. Antrim, W. H. P. Craigauntlet, Co. Down, R. Ll. P.

divisilobum. See *proliferum.*

exile. Holywood, Co. Down, W. H. P.

frondosum. Castlereagh, Co. Down, W. H. P.

furcillatum. Finnebrogue, Co. Down, W. H. P.

gracile. Castlecoole, Co. Fermanagh, W. H. P.

grandiceps. Cave Hill, Co. Antrim, John Bland. A very rare variety; the Cave Hill plant is distinct from other forms of *grandiceps.*

grandidens. Co. Fermanagh, Rev. R. Eccles, and L. Erne, Rev. W. Bailey, Moore's N.P. Ferns. Craigavad, Co. Down, W. H. P. and R. Ll. P.

grandidens truncatum. Craigavad, Co. Down, R. Ll. P. Does not grow more than four inches high.

inæquale. Crow Glen, Co. Antrim, W. H. P. Castlereagh, Co. Down, W. H. P. and R. Ll. P. Cultra, Co. Down, R. Ll. P.

inæquale setosum. Glendevis, Co. Antrim, W. H. P.

incurvatum. Ormeau, Co. Down, W. H. P.

interruptum. Crawfordsburn, Co. Down; Lisburn and Springfield, Co. Antrim, W. H. P. Holywood, Co. Down, W. H. P. and R. Ll. P. Cultra and Dundonald, Co. Down; and Glenarm, Co. Antrim, R. Ll. P. Several different varieties appear to be included under this name. Thus, our Holywood plant is a symmetrical and pretty form, while that from Crawfordsburn, and much more some of the Devonshire forms of *interruptum,* are widely different, being very irregular and ragged.

interruptum caudatum. Glenarm Park, Co. Antrim, R. Ll. P.

interruptum setosum. Stormont, Co. Down, R. Ll. P.

irregulare. Holywood, Co. Down, W. H. P.

laciniatum. Holywood, Co. Down, W. H. P. Craigauntlet, Co. Down, R. Ll. P.

latifolium. Knock, Co. Down, R. Ll. P.

laxum. Castlereagh and Crossgar, Co. Down; and Kilroot, Co. Antrim, W. H. P. Dundonald and Cultra, Co. Down, R. Ll. P.

lineatum. Cultra, Co. Down, R. Ll. P. Has not, so far, proved constant.

multifidum. Dundonald, Co. Down, R. Ll. P.

multilobum laxum. Castle Dobbs, Co. Antrim, R. Ll. P.

perserratum. Glenarm, Co. Antrim, R. Ll. P.

polydactylum. Glendevis, Co. Antrim, W. H. P. Stormont, Co. Down, R. Ll. P.

proliferum. Following the classification of the leading pterodological authorities, we arrange this difficult and beautiful class of varieties under two heads—acutilobes and divisilobes. Mr. Wollaston thus characterises the two subdivisions:—

a. acutilobum. Tripinnate; all divisions of frond acute, anterior and posterior pinnules almost of same length.

b. divisilobum. Tripinnate; same as *acutilobum*, except that the anterior and posterior pinnules are of very unequal length, the latter far longer, and the divisions altogether more highly developed. A well-grown plant is subquadripinnate or even quadripinnate. Our district has so far yielded only a few of these beautiful varieties, but such as have been found eminently maintain its reputation as a first-class hunting-ground.

a. acutilobum. Castlereagh, Co. Down, W. H. P. Castle Dobbs, Co. Antrim, R. Ll. P.

b. divisilobum. Castlecoole, Co. Fermanagh, W. H. P. (*divisilobum laxum, Jones*). Characterized by Mr. Wollaston as "a gem of the first water."

divisilobum Crawfordiæ. (*proliferum Crawfordianum* of *Stansfield*). Crawfordsburn, Co. Down, Miss Crawford. This is the celebrated Crawfordsburn Fern, one of the most beautiful of a beautiful class, which was found near Crawfordsburn in 1861 by a labourer of Miss Crawford, only a single plant being discovered at the time, and in spite of frequent search it has never been found since. The plants usually sold as Crawfordsburn Ferns in the market are a far commoner form, viz.—*divisilobum Alchinii.* The genuine plant is found in very few collections; it is easily recognisable by the very broad and overlapping character of the pinnæ, and the extreme breadth of the fronds.

quadratum. Co. Antrim, A. Stansfield, Moore's N.P. Ferns.

retroflexum. Glenarm, Co. Antrim, R. Ll. P.

revolvens. Castleton, Co. Fermanagh, W. H. P.

rotundatum. Ligoniel, Co. Antrim; and Castlecoole, Co. Fermanagh, W. H. P. Craigavad, Co. Down, R. Ll. P. The first-mentioned is a splendid rotundate form; the others are not so distinct.

rotundo-interruptum. Holywood Hills, Co. Down, W. H. P. and R. Ll. P.

setosum. Castlereagh, Co. Down, W. H. P. Cultra, Co. Down, R. Ll. P.

setoso-gracile. Castlecoole, Co. Fermanagh, W. H. P.

setoso-variegatum. Castlereagh, Co. Down, W. H. P.

tripinnatum. Castle Dobbs, Co. Antrim, W. H. P. Holywood and Stormont, Co. Down, R. Ll. P.

truncatum. Colin Glen, Co. Antrim, W. H. P. Stormont, Craigauntlet, and Crawfordsburn, Co. Down, R. Ll. P. Truncate forms are not uncommon, but are generally inconstant; the Crawfordsburn plant is the best we have found.

varians. Holywood and Cultra, Co. Down, W. H. P.

variegatum. Dundonald, Co. Down, R. Ll. P. Variegated forms are extremely rare.

5. ATHYRIUM. LADY FERN.

1. A. FILIX-FŒMINA. **Common Lady Fern.**

Woods, hedgebanks, and mountains. Abundant and generally distributed. Occurs up to a considerable elevation on the mountains, growing in sheltered corners among stones.

adpressum. Cultra Wood, Co. Down, R. Ll. P.

apuæforme. Stormont, Co. Down, W. H. P. A very neat crested form.

conioides. Near Scrabo Hill, Co. Down, Du Noyer. Glenarm, Co. Antrim, R. Ll. P.

conioides multifidum. Above Holywood, Co. Down, Miss L. Munster. Near Craigauntlet, Co. Down, R. Ll. P. The Holywood Hills district has thus thrice yielded varieties of the *conioides* type.

cristatum. Bryansford, Bloody Bridge, and Cultra, Co. Down, W. H. P.

cristatum laxum. Ballynahinch, Co. Down, W. H. P.

crispum. On Orra More, Co. Antrim, A. Smith. This was the original discovery of this well-known and beautiful form, which is to be found in every collection.

cruciato-cristatum. Castlerock, Co. Derry, R. Ll. P. A very remarkable form.

cruciatæ-pinnulæ. Castlerock, Co. Derry, R. Ll. P. A very rare variety.

decompositum. Craigauntlet, Co. Down, R. Ll. P.

elegans. Duneight, Co. Antrim, Rev. W. D. Pounden. A beautiful form, approaching *plumosum.*

foliosum. Craigauntlet, Co. Down, R. Ll. P.

Frisellиæ. Seven Acres, Fanet, Co. Donegal, H. C. Hart. A very rare variety.

frondosum. Dundonald, Co. Down, W. H. P. Cushendun, Co. Antrim, R. Ll. P.

glechenioides. Colin Glen, Co. Antrim, W. H. P.

gracile. Inch near Downpatrick, Co. Down, W. H. P.

inæquale. Bryansford, Co. Down, and Killymoon, Co. Tyrone, W. H. P. Dundonald, Stormont, Holywood, Craigauntlet, and Newcastle, Co. Down; and Glenarm, Co. Antrim, R. Ll. P.

incisum. Killybegs, Co. Donegal, R. Barrington, Moore's N. P. Ferns.

interruptum. Carlingford Mountain, Co. Louth, W. H. P. Sea-cliffs south of Torr Head, Co. Antrim, R. Ll. P.

interruptum Phillips (*Clapham*). (*Cruciatæ-pinnulæ, Fox*). Holywood, Co. Down, W. H. P., 1864; and R. Ll. P., 1884. Newcastle, Co. Down, W. H. P. Garron Point, Co. Antrim, and Lough Sheelin, Co. Cavan, R. Ll. P.

laciniatum. Killybegs, Co. Donegal, R. Barrington, Moore's N. P. Ferns. Holywood, Co. Down; and Garron Point and Glenarm, Co. Antrim, R. Ll. P.

latifolium. Craigauntlet, Co. Down, R. Ll. P.

latifolium Praeger (*Wollaston*). Castlerock, Co. Derry, R. Ll. P.

multifidum. Dunmore, Co. Down, Wylie. Stormont, Co. Down, W. H. P. and R. Ll. P. Dundonald, Co. Down, R. Ll. P.

ramosum. In a cave at Newcastle, Co. Down, W. S. Johnston. Holywood, Co. Down, R. Ll. P.

rectangulare. Castlerock, Co. Derry, R. Ll. P.

reflexum. Rademon Demesne, Co. Down, W. H. P. Newcastle, Co. Down, R. Ll. P.

reflexum multifidum. Castlerock, Co. Derry, R. Ll. P.

reflexum furcatum. Dundonald, Co. Down, R. Ll. P.

rhœticum. Cushendall, Co. Antrim, David Moore. Killybegs, Co. Donegal, R. Barrington. We do not know the variety as a distinct form.

6. ASPLENIUM. SPLEENWORT.

1. A. ADIANTUM-NIGRUM. **Black Spleenwort.**

Old walls, dry banks, and rocks. Very general. Ascends to over 1000 feet on the mountains. Plentiful on banks by roadside south of Rostrevor, growing freely among the grass—an unusual position; old walls are its favourite haunt.

acutum. "In a dark cave among the Mountains of Mourne, County of Down; Sherard." Raii Synopsis (1724) (*Filix minor longifolia*, &c.). Very sparingly on basaltic cliffs on Binevenagh, Co. Derry, S. A. Stewart. On an old hedgebank near Newtownards, Co. Down, R. Ll. P.

Sherard's note would seem to be the original record of this beautiful fern from the British Isles. There appear to be two forms of this plant—an extreme form, which is the Killarney *acutum*, and with which, from the Latin description, Sherard's plant appears to be identical; and an intermediate form, to which the specimens from Binevenagh and Newtownards belong, and which is plentiful in Madeira, the Azores, and parts of Spain, which Mr. Wollaston, one of our greatest pterodological authorities, raises to the rank of a species—*Asplenium acutum.* Fronds of our Newtownards plant have been sent to several of the leading pterodologists, and the following opinions speak for themselves :—

"It is identical with the one I found all through the Pyrenees. I hardly think that it is a distinct species, though very distinct as a variety."—E. J. Lowe. "*Asplenium Acutum* (*Lowe*) of Madeira, which as a British plant, has only been found on mountains in the south-west of Ireland."—G. B. Wollaston. "The *Asplenium* I consider an acute form of *Adiantum-nigrum.*"—A. M. Jones.

2. A. MARINUM. **Sea Spleenwort.**

Maritime rocks. Occurs in all suitable localities in the district.

Antrim.—Plentiful all round the coast.

Down.—Portavoe, very rare, W. H. Patterson. Abundant on the rocks at Newcastle.

Derry and Donegal.—Abundant along the coast line, wherever rocks occur.

3. A. TRICHOMANES. **Maidenhair Spleenwort.**

Walls, rocks, and dry banks. Very general; localities are unnecessary. Ascends to a considerable elevation on the mountains.

depauperatum. Knockmore, Co. Fermanagh, W. H. P.

interruptum. (*Moulei, Stansfield*). Rocks on north side of Slieve Donard, Co. Down, R. Ll. P.

multifidum. Near Sligo, and in Co. Fermanagh, W. H. P. Garron Point, Co. Antrim, R. Ll. P.

4. A. VIRIDE. **Green Spleenwort.**

Alpine rocks. Very rare.

Donegal.—Mountains near Lough Eske, E. Murphy. Gully on the north side of Slieve League, Cyb. Hib. Supplement. Lough Salt Mountains, by the waterfall above Lough Eske, and old walls near Raphoe, H. C. Hart.

Fermanagh.—Mountains near Florencecourt, T. Plunket.

Sligo.—Ben Bulben, Dr. Mackay; since found there, T. H. Corry, H. C. Hart, W. H. P.

Leitrim.—On the Glenade Mountains, W. H. P.

5. A. RUTA-MURARIA. **Wall Rue.**

Old walls, and very rarely on rocks. Very generally distributed. Luxuriantly on limestone cliffs in Co. Cavan; a few plants on basalt at Fair Head; R. Ll. P. The latter is the only case in which we have known this species to grow on anything but lime. Ascends to 1,800 feet on the Ben Bulben range, T. H. Corry.

7. SCOLOPENDRIUM.

1. S. VULGARE. **Hart's tongue.**

Woods, shady banks, and old walls. Very general. Rare about Warrenpoint and Rostrevor, R. Ll. P.

cornutum. Dundonald, Co. Down, R. Ll. P.

crenatum. Castlerock, Co. Derry, R. Ll. P.

crispum. Castleton, Co. Fermanagh, Rev. W. D. Pounden. Strabane Glen, Co. Tyrone, W. H. P. A rare and beautiful variety.

cristatum. Craigdarragh, Co. Down, Mrs. Munster, and later, R. Ll. P.

inæquale. Clandeboye, Co. Down, R. Ll. P.

involvens. Grey Point, Co. Down, R. Ll. P.

marginatum. Grey Point, Co. Down, R. Ll. P.

marginato-cornutum. Grey Point, Co. Down, R. Ll. P. A curious dwarf form, about three inches high. Leafy portion of frond almost absent.

multifidum. Colin Glen and Redhall, Co. Antrim, W. H. P. Glenarm and Woodburn, Co. Antrim; Dundonald, Co. Down; and Castlerock, Co. Derry, R. Ll. P.

muricatum. Glendevis, Co. Antrim; and Belleek, Co. Donegal, W. H. P.

peraferens. Colin Glen, Co. Antrim, W. H. P.

peraferens variegatum. Colin Glen, Co. Antrim, W. H. P.

polycuspis. Co. Fermanagh, T. Plunket. Glencraig, Co. Down, R. Ll. P.

ramosum. Castlereagh, Co. Down, and Castle Dobbs, Co. Antrim, W. H. P. Castlerock, Co. Derry, in a sea-cave, R. Ll. P.

revolvens. Castlecoole, Co. Fermanagh, W. H. P.

supralineatum. Marble Arch, Co. Fermanagh, and Knocknarea, Co. Sligo, W. H. P.

undulosum multifidum. Redhall, Co. Antrim, R. Ll. P.

variegatum Phillipsii (*T. Moore*). Colin Glen, Co. Antrim, W. H. P. One of the handsomest new varieties which our district has yielded, the fronds having a white margin.

8. CETERACH.

1. C. OFFICINARUM. **Scale Fern.**

Old walls. Very local.

Antrim.—Cave Hill, on the Deerpark wall (still there), and Galgorm near Ballymena, Templeton, 1801. Castle Dobbs, W. H. Ferguson. Muckamore, very rare, D. Redmond. Abundant on an old bridge over the Clough Water, between Clough and Broughshane, Rev. H. W. Lett. Abundant on Park Mill Bridge five miles from Glenarm, and on walls and a bridge in Glenarm Deerpark, R. Ll. P.

Down.—Old wall at Donaghadee (still there), and on a wall at Freemount north of Newry, Rev. G. Robinson. Rostrevor, Crawford. Bryansford, W. Thompson. Turner's Hill near Newry, C. Dickson. Hillsborough Park wall, Rev. C. H. Waddell. A single plant on a garden wall at Sydenham, Miss M. Patterson—possibly an escape. Near Killinchy, J. Wilson. Old wall near Newcastle, W. H. P.—since observed there, R. Ll. P. Old wall at Rademon House, R. Ll. P.

Armagh.—Goraghwood, Rev. G. Robinson. Near Bessbrook, and on the wall of Lurgan Demesne, Rev. H. W. Lett.

Donegal.—Ballyshannon, H. Allingham. Old wall at Brown Hall—very rare in Donegal—H. C. Hart. Bridge over the Lennan between Lough Fern and Ramelton, Rev. L. O'Brien. Near Bundoran, W. H. P.

Tyrone.—Cappagh, Dr. Kinahan.

Fermanagh.—Florencecourt, Hon. J. L. Cole.

Leitrim.—Glenade, S. A. Stewart.

crenatum. Abundant on Rough Fort Bridge, Co. Antrim, B.N.F.C., 1878, and often since observed. It is singular that only the crenate form occurs there. Park Mill Bridge on the Glenarm River, Co. Antrim., R. Ll. P.

9. BLECHNUM.

1. B. SPICANT. **Hard Fern.**

Woods, heaths, and mountains. Abundant.

Ascends to nearly 2000 feet.

anomalum. This curious variety, in which all the fronds are fertile half way down, occurs abundantly on the Mourne Mountains, chiefly at the Newcastle end, but we have not heard of its having been found in any other locality in the province.

anomalum inæquale. Newcastle, Co. Down, R. Ll. P.

anomalum multifidum.
anomalum trinervium.
bifidum.
caudatum.
crispatum.
cristatum.
cruciatum.
} On mountains near Newcastle, Co. Down, W. H. P.

crenatum. Drumsough, Co. Antrim, W. H. P.

foliosum. Rostrevor, Co. Down, W. H. P.

heterophyllum. Glenarm Deerpark, Co. Antrim, R. Ll. P.

multifidum. Holywood Hills, and Dundonald, Co. Down, R. Ll. P.

ramosum. Newcastle, Co. Down, R. Ll. P.

serratum. Holywood Hills, Co. Down, R. Ll. P.

strictum. Bloody Bridge near Newcastle, Co. Down; and Strabane Glen, Co. Tyrone, W. H. P.

trinervium. This striking variety occurs abundantly at the Newcastle end of the Mourne Mountains, where it was first observed by W. H. P. in 1876, and where it forms a peculiar feature of the local flora. The fronds are shaped like a cross-handled sword, owing to the extraordinary development of the lowest pair of lobes, which sometimes measure three to four inches across.

undulosum Praeger (*Wollaston*). Craigauntlet, Co. Down, R. Ll. P.

The Mourne Mountains are very rich in varieties of *Blechnum*, as the above list shows.

10. PTERIS.

1. P. AQUILINA. **Brakes or Bracken.**

Woods, heaths, and wastes. Very common.

A comparatively lowland species, rarely ascending so high as 1,000 feet on the mountains.

multifidum. Kilmore, Co. Down, S. A. Stewart.

variegatum. Killeen near Sydenham, Co. Down, A. Robertson. Coleraine, Co. Derry, Rev. Robert Kyle. In Glenariff, Co. Antrim, and near Castlerock, Co. Derry, R. Ll. P. An extremely rare variety.

11. ADIANTUM. MAIDENHAIR.

1. A. CAPILLUS-VENERIS. **Common Maidenhair.**

Extremely rare.

Wet rocks near sea.

Donegal.—In one place on the cliffs of Slieve League, Rev. L. O'Brien. Found in a second locality in this district by the B.N.F.C. in 1880, when it was thought advisable not to publish the exact spot.

Leitrim.—Glencar, J. Wynne, and later by R. Barrington and R. P. Vowell.

Reported to grow in Dunkerry Cave, Giants' Causeway, but confirmation is very necessary. Also reported from Glenariff, Co. Antrim.

12. CYSTOPTERIS. BLADDER FERN.

1. C. FRAGILIS. **Brittle Bladder Fern.**

Rare.

Wet rocks and old walls.

Ascends to about 1,500 feet on the mountains.

At 1,850 feet on the Ben Bulben range, T. H. Corry.

Antrim.—Woodburn Glen, Templeton. Sallagh Braes, G. C. Hyndman, and later, B.N.F.C. Glenariff, B.N.F.C., and later, W. H. P. and R. Ll. P. Walls of Retreat Castle near Cushendall, T. H. Corry. Glenarm Deer-park, Linford River, Trostan, and on limestone at Murlough Bay, and very abundant by roadside near Retreat railway station, R. Ll. P.

Down.—Mountain above Tollymore Park, W. Thompson. Slieve Donard, Dr. Dickie. In Rademon Demesne, and on Slieve-na-glough, Shanslieve, and the mountain north of Cove M., R. Ll. P.

Armagh.—On an old bridge near Armagh, W. M'Crum.

Derry.—By the River Roe near Limavady, David Moore.

Donegal.—Alt Mountain near Ardara, Binmore, Coolcross, and Bulbein Mount, and near Pettigo, Laghy, and Moynalt, H. C. Hart.

Tyrone.—Dart Mountain, Admiral Jones.

Fermanagh.—In the baronies of Magheraboy and Clanawley, S. A. Stewart. Knockmore, W. H. P.

Monaghan.—Anketell Grove, Miss Moffett.

Cavan.—Common in the barony of Tullyhaw, S. A. Stewart.

Sligo.—Ben Bulben, Dr. Dickie; and later, W. H. P., &c.

angustata. Knockmore, Co. Fermanagh, S. A. Stewart.

dentata. Cavan and Fermanagh; frequent in the district west of Lough Erne, S. A. Stewart.

13. TRICHOMANES. BRISTLE FERN.

1. T. RADICANS. **Killarney Fern.**

Very damp shady rocks. Extremely rare.

Donegal.—In the *Journal of Botany*, vol. XXII. (1884), p. 213, the following note occurs:—*Trichomanes radicans* in Donegal—On the 25th May last, Mr. Pierce Mahony, whilst following his duties in connection with the Irish Land Commission, discovered the Killarney Fern in a valley in N.W. Donegal. Miss Grove, of Castle Grove, has also seen it in the same valley, and specimens have been sent to Dublin. I think it advisable to withhold the exact locality. This information has been given me by Mr. Ulick Bourke, Irish Land Commission.—H. C. Hart.

14. HYMENOPHYLLUM. FILMY FERN.

1. H. TUNBRIDGENSE. **Tunbridge Filmy Fern.**

Moist shady places. Very rare.

Antrim —In Glendun, Rev. S. A. Brenan.

Down.—On Slieve Donard, Dr. Dickie.

Armagh.—In a Glen on Ferry Hill, above Narrow Water, R. Ll. P.

Donegal.—South Donegal, B.N.F.C., 1880. Slieve League, C. Dickson. Glenveigh, by the lakeside, and in the "Backwood," Carradoan, H. C. Hart.

Tyrone.—In a glen between Aughnacloy and Augher, Cyb. Hib. Supplement.

Fermanagh.—Mountain near Florencecourt, Rev. S. A. Brenan.

latifolium. In a glen on Ferry Hill, Co. Armagh, R. Ll. P. A very curious new variety, some of the fronds measuring over two inches across.

2. H. WILSONI. **One Sided Filmy Fern.**

Wet rocks. Frequent.

Antrim.—Colin Glen and Glenariff, Templeton—since observed in latter station, R. Ll. P. Rocks at the base of M'Art's Fort, Cave Hill, G. C. Hyndman, 1838, and later by others. Slievenanee, Dr. Dickie. Sallagh Braes, S. A. Stewart, and later, B.N.F.C. Glendun, Rev. S. A. Brenan. Glenarm Deerpark, W. Darragh. By Carnlough River, and on Binnagee, R. Ll. P.

Down.—Tollymore Park, Cove Lough, and north side of Diamond Mountain, Templeton, 1796; often since observed in first of these stations. In a cave on Slieve Lamagan, and on the mountain north of Cove Mountain, R. Ll. P.

Derry.—On Benbradagh and Dart Mountains, David Moore.

Donegal.—Innishowen, W. Thompson. Errigal, Nephin, and Slieve League, Dr. Dickie. Glencolumbkill, B.N.F.C., 1871. Buncrana, T. H. Corry. Erris Mountains, Glenveigh, Poisoned Glen, Carradoan, Errigal, and to the summit of Slieve Snacht West (2200 feet), Coolcross, and Gap of Mamore, H. C. Hart.

Tyrone.—Gorteen Gap, Dr. Kinahan.

Fermanagh.—Florencecourt, Hon. J. L. Cole. Knockmore and Drumbad, S. A. Stewart.

Cavan.—Cuilceagh, and Slievenakilla, S. A. Stewart.

Sligo.—Annacoona east of Ben Bulben, R. Barrington and R. P. Vowell.

ramosum. In a cave on Slieve Lamagan, Mourne Mountains, R. Ll. P. An extraordinary variety, the frond being often four or five times branched.

15. OSMUNDA.

1. O. REGALIS. **Royal Fern.**

Very local.

Marshes and margins of streams.

Antrim.—Lakeshore at Shane's Castle, G. C. Hyndman—extinct there now. Near Ballinderry, Sefton. Bog at Springmount near Glarryford, J. H. Garrett—exterminated about 1855, Rev. H. W. Lett.

Down.—Donard's Cave in the Mourne Mountains, Kirkiston Bog, bog near Greyabbey, and by a lake S.W. of Castlewellan, Templeton, 1793. By the river above Newcastle, W. Thompson—here it grew abundantly till 1877, when it was completely exterminated, Rev. H. W. Lett. River at Bloody Bridge, and in a cave at the same place, C. Dickson. By the Kilbroney River near Rostrevor, Mr. Turretin. Near Killinchy, J. Wilson. Bog near Kirkcubbin, C. H. Brett. Sea-cliffs at Newcastle, R. Ll. P.

Armagh.—Bog at the south end of Lough Neagh, Templeton—this station is probably the Moyntaghs Bog, where it still flourishes, R. Ll. P.

Derry.—By the River Bann, below Portglenone, and by a lake near Kilrea, David Moore.

Donegal.—Lough Eske, and Goat Island, Lough Erne, R. Barrington. Culdaff, Gweedore, Glenties, Killybegs, and very plentiful in Glen Columbkill, Dr. Dickie. Very rare in Innishowen, H. C. Hart. Ballyshannon, H. Allingham. Shores of Lough Derg, S. A. Stewart. Arran Isles, H. C. Hart. Bundoran, W. H. P.

Tyrone.—Strabane Glen, W. H. P.

Fermanagh.—Carrick and Drumbad—abundant and luxuriant by the streams, S. A. Stewart. Carrick Lake, W. H. P.

Leitrim.—On the Glenade Mountains, W. H. P.
Sligo.—Shores of Lough Gill, R. Barrington and R. P. Vowell.
interrupta. Carrick Lake, Co. Fermanagh, W. H. P. A very distinct new variety.

16. BOTRYCHIUM. MOONWORT.

1. B. LUNARIA. **Common Moonwort.**
Dry natural pastures. Rather local.
Antrim.—Near the second lock on the Lagan Canal, Hannahstown, Knockagh, Black Mountain, and Knocklayd, Templeton. Wolfhill, G. C. Hyndman. Altmore Glen near Cushendall, W. Thompson. Above Colin Glen, S. A. Stewart. Shane's Castle, Squire's Hill, and near Randalstown, B.N.F.C. Near Kells, D. Redmond. Cave Hill, C. H. Brett and W. H. P. Carnaneigh, shore at Cushendun, and on Crosslieve near Cushendall, R. Ll. P.
Down.—Scrabo Hill, Templeton, 1806. Carngaver Hill, and on sandhills near Newcastle railway station, S. A. Stewart. Carrowreagh Hill near Craigauntlet, and Conlig Hill, R. Ll. P.
Derry.—On Benevenagh, David Moore.
Donegal—Culdaff, Dr. Dickie. Templecarn, near Pettigo, Miss Young. Gweedore, P. Mahony. Near Burnfoot, Charles Moore. Leenane, Carrablagh, west side of Rossgull, Seven Arches, Mullaghmore, and Kildrum, H. C. Hart.
Cavan.—Lough Sheelin, R. Ll. P.
Sligo.—Near the summit of Ben Bulben, S. A. Stewart.

17. OPHIOGLOSSUM. ADDER'S TONGUE.

1. O. VULGATUM. **Common Adder's Tongue.**
Moist natural pastures. Rather local.
Antrim.—By the Lagan near the second lock, Templeton, 1806. On the Knockagh, W. Thompson, and B.N.F.C. 1886. Malone, Dr. Dickie. Wolfhill, W. Millen. Colin Glen and Rathlin Island, S. A. Stewart. Shane's Castle, 1863, and Cave Hill, 1871, B.N.F.C. Bog Meadows, and Springfield, W. H. P. Plentiful in fields at Cairncastle, R. Ll. P.
Down.—Greyabbey, 1864, and Mountstewart, 1877, B.N.F.C. Near Cultra House, Robert Patterson—still there. Killinchy, J. Wilson. Crawfordsburn, Mrs. Munster.

Armagh.—Ardmore near Lurgan, and abundant in short grass on the shores of Lough Neagh, where it is under water for four winter months, Rev. H. W. Lett.

Derry.—Springhill, Garvagh, Somerset, Mountsandal, and sandhills at Magilligan, David Moore.

Donegal.—Kilderry, W. E. Hart. Ballyshannon, Carrablagh, Glinsk, Horn Head, Brown Hall, and very abundant at Leenane, H. C. Hart.

Leitrim.—Near the base of Arroo Mountain, Kinlough, R. Barrington and R. P. Vowell.

2. O. LUSITANICUM. **Dwarf Adder's Tongue.**

Dry natural pastures. Extremely rare.

Donegal.—On Horn Head and on Carrigan Head, H. C. Hart. One of our rarest local ferns, whose only known British station—if British it may be called—was Guernsey, till Mr. Hart discovered it on Horn Head in 1878. The same observer has since found it in Co. Kerry.

Holywood, Co. Down,
November 26th, 1886.

W. H. PHILLIPS.
R. LLOYD PRAEGER.

10 AUG 1887
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APPENDIX II.

VOL. II.

THE ESTUARINE CLAYS

AT THE NEW ALEXANDRA DOCK, BELFAST, WITH LIST OF FOSSILS

BY R. LLOYD PRAEGER, B.E., B.A.

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On The Estuarine Clays

AT THE

NEW ALEXANDRA DOCK, BELFAST.

IN the construction of the new Alexandra Graving Dock, on the County Down side of the river Lagan, some good sections of our Post-tertiary Estuarine deposits have been exposed. Being constantly on the ground, I have had a favourable opportunity of observing the different beds over a considerable area, with the organic remains which they contain, and I propose to briefly describe the various strata pierced through in connection with this work, and some of their characteristic fossils.

The Pleistocene Clays of the Lagan Estuary have already been closely scrutinised by members of this Club, and in the very complete list compiled by Mr. S. A. Stewart, F.B.S.E.,* containing the results of his own and Mr. (now Rev. Canon) Grainger's † extensive researches, no fewer than 142 species of fossils are recorded as occurring in these beds. An examination of the deposits exposed in the excavations at the Alexandra Dock has resulted in some additions to this list, and in the present paper I shall notice such species as are noteworthy from their abundance or otherwise in particular beds, or which have not previously been recorded from our North of Ireland Estuarine Clays, and an annotated list is added of all fossils recently observed in the deposits in question.

Figure 1 represents a section measured with the spirit-level near the inner entrance of the Dock, and it may be taken as a typical section of the beds exposed. Their relative thickness varied considerably in different parts of the works, but the same sequence was noticeable throughout; and a similar general relation may be observed, not only where borings or sections have been made

* Stewart—"Fossils of the Estuarine Clays of Down and Antrim,"—Proc. Belfast Naturalists' Field Club, Vol. 1., Appendix II.

† Grainger, in Natural History Review, Vol. VI., for 1859.

through the strata in the Lagan Estuary, but in the Quaternary Estuarine deposits in other parts of Ireland, and in England and Scotland. At the Alexandra Dock we have first several feet of clay and sand, which bed was still in course of formation when the works were commenced, its upper surface being a little above low water mark. Below this is a bed of yellow sand, containing many shells, which probably corresponds in age with the flint-bearing gravels of the Kinnegar at Holywood and the Curran at Larne. Immediately underlying this is that very distinct deposit, the Estuarine Clay, which at Belfast, Larne, and other points around our coasts, possesses the same peculiar features and yields the same characteristic fossils. Below this is a bed of peat, corresponding with the submerged peat which occurs in so many places on the shores of the British Isles. This rests on fine red glacial sand, the same deposit which occurs at Malone and at the Knock; which rests in turn on very fine tough red clay—re-assorted Boulder Clay. Underlying this is the Boulder Clay proper, with glacially striated pebbles, which, finally, overlies the New Red Sandstone. These last two formations were not exposed at the Dock, but there is no doubt they underlie the red clay, as they do at other points in the immediate vicinity. We have thus an unbroken series of deposits, stretching from the Boulder Clay Period to the present day, and "offering," says Mr. Stewart, "perhaps the best means of filling up the gap in geological history between the close of the Glacial Epoch and the present day."

So much for the general section. I now come to a more minute description of the deposits, and shall begin with the section which is shown in Figure 1. This is as follows:—

1. Blackish clay, with sandy layers, of a depth of six to seven feet, the surface between tide marks. Characteristic shells of this deposit are:—*Mya arenaria*, *Cardium edule*, *Tellina Balthica*, *Mytilus edulis*. *Mya* occurs in beds of thousands, the shells all in the position in which they lived, and generally with the siphonal tube preserved. *Cardium* is also very abundant. This bed yielded two specimens of *Helix nemoralis*, no doubt washed into it by surface water; and unusually large single valves of *Lucina borealis* were not unfrequent.

2. Two feet of coarse yellow sand, with abundance of shells, and also thin layers of twigs and hazel nuts. The shells are often much worn, and generally occur as single valves, and the deposit has all the appearance of an old sandy beach. *Pecten opercularis*, *Littorina litorea*, *Mytilus edulis*, occurred here abundantly, and fine specimens of *Tapes pullastra*, *T. decussatus*, and *Thracia convexa*, which two latter species are not now found living in Belfast Lough. Among the rarer forms which were noticed were:—*Fissurella Græca*, *Trochus magus*, *Patella vulgata*, *Fusus antiquus*, *Murex erinaceus*, *Cypræa Europæa*, *Anomia patelliformis*, *Venus lincta*, *Cyprina Islandica*. Six species new to our Estuarine Clays were observed:—*Fusus gracilis*, *Anomia striata*, *Tapes virgineus*, *Venus fasciata*, *V. exoleta*, *Arca tetragona*. Several worn valves of *Scrobicularia piperata* were noticed—this shell will be referred to later on—they had probably been washed from the underlying beds.

3. Immediately below the yellow sand, the line of demarcation being remarkably sharp and well defined, is the Estuarine Clay proper. This formation, as Mr. Stewart has shown,* consists at Belfast of two beds which were laid down under widely different circumstances—an upper one, which was deposited in some thirty or forty feet of water at least, and a lower one, which is of a littoral character. The upper bed consists of very fine homogeneous blue clay, and is here about six feet thick. It is remarkably rich in shells, both large and small, many of which do not now exist in our waters, and they are for the most part in a beautiful state of preservation. *Thracia convexa*, *Lucinopsis undata*, *Cardium echinatum*, *Scrobicularia alba*, *Ostrea hippopus*, *Acera bullata*, are abundant, and characteristic of the deposit. Among many rare fossils obtained from this bed may be mentioned:—*Actæon tornatilis*, *Cyprœa Europœa*, *Cardium Norvegicum*, *Tellina tenuis*. Not hitherto recorded from the Belfast bed are:—*Aclis supranitida*, *Trochus umbilicatus*, *Rissoa striata*, *Melampus bidentatus*, *Utriculus obtusus*, *Cardium nodosum*; and the following are new to the deposits:—*Capulus Hungaricus*, *Helcion pellucidum*, *Cylichna cylindracea*, *Utriculus mammillatus*, *Anomia aculeata*, *Echinus sphœra*. Beds occur of *Ostrea* and *Pecten maximus*, both of which attain a large size; *Scrobicularia piperata* is almost unknown. Near the top of the deposit a shell layer occurred, made up almost entirely of *Scrobicularia alba* and the spines of two Echinoderms—*Amphidotus cordatus* and *Echinus miliaris*. It is to be noted that the former, which now occurs around our coasts only in sandy bays, here lived abundantly on a bottom entirely muddy.

At the base of the bed just described is a narrow zone in which the boring shells, *Pholas crispata* and *Pholas candida*, occur in profusion; this layer was also observed by Mr. Stewart on the County Antrim side of the Lagan. The shells are found in a horizontal bed, all in the position in which they lived. *P. crispata* is of very large size, twice the size which it now attains on the North of Ireland coasts—one specimen measured five inches in breadth by seven and a half in girth. The occurrence of these shells between the overlying deep-water clay and the underlying littoral deposit is of great interest, "and their appearance," says Mr. Stewart, "is the first intimation of the subsidence then commenced."

4. We now come to the lower clay, which had a depth of between six and seven feet. It is of a more sandy nature, and has a yellower colour than the upper bed, and is full of the remains of the Grass Wrack, *Zostera marina*, which furnishes further proof, if such were needed, that this is a shallow water deposit. But the contained fossils testify this conclusively. *Scrobicularia piperata* is the leading shell of this bed, occurring all through in extraordinary profusion; an essentially littoral species, which is now quite extinct on our northern coasts. Other characteristic fossils are:—*Littorina litorea*, *Cardium edule*, *Tapes decussatus*. The latter attains by no means so large a size as it does in the bed

* Stewart—"Latest fluctuations of the sea-level on our own coasts," Eighth Annual Report, Belfast Naturalists' Field Club, 1871.

of sand above. Shells are far more abundant than in the upper clay, but the number of species much more limited, and they are many of them in a fragile condition. Rare forms which were noticed here are:—*Scaphander lignarius*, *Pleurotoma septangularis*, and *Eulima bilineata*; also *Philine scabra*, *Pecten pusio*, and *Mactra solida*, var. *elliptica*, which are new to the Clays. At the base the bed becomes very sandy, and *Tellina Balthica* is abundant, along with quantities of *Cardium edule* of small size. The lowest zone consists of grey sand, and is quite unfossiliferous.

5. Immediately underlying the basal sandy layer of the lower clay is the bed of peat before-mentioned, which is now some 27 feet below high water mark, showing a corresponding subsidence of the land. Of course a far greater subsidence, followed by upheaval, has taken place; for if the upper clay was deposited in 40 feet of water, the total depression must have amounted to 50 or 60 feet, followed by 30 or 40 feet of subsequent upheaval. The peat is one to two feet thick, very much compressed, and had originally a much greater depth, as is shown by the flat ellipses into which round branches have been pressed. It is full of trunks and boughs of trees, some of which extend upward into the grey sand. Among the vegetable remains, Willow, Hazel, and Alder are easily recognisable. Hazel nuts occur, and the cones of the Scotch Fir. The broad leaves of the Iris are frequent, with remains of rushes and sedges. But the most interesting fossils which the submerged peat yielded were the bones of large quadrupeds—a tusk and two portions of the jaw of the Wild Boar, and a rib, vertebra, and leg-bone of the Red Deer. Wing-cases of insects are of not unfrequent occurrence, and in a tolerable state of preservation. In one place a layer of grey sand occurred in the middle of the peat, rapidly thinning out in all directions. A sample of this was kindly examined microscopically by Mr. Joseph Wright, F.G.S., but no organic remains were found. That the vegetation which formed this peat flourished on the spot on which it now rests, and was not drifted thither, is proved by the abundance of fine roots which descend several feet into the underlying deposit, which consists of

6. Grey sand, some two to three feet deep, very fine on the top, coarser below. In addition to the roots from the peat, of which the sand is full, the only organisms which this bed yielded were Foraminifera and Ostracoda, of which Mr. Wright, who has very kindly examined samples of all the deposits at the Dock for microscopic forms, detected seven species, namely:—*Miliolina seminulum*, *Bulimina pupoides*, *Lagena lævigata*, *Rotalia Beccarii*, *Nonionina depressula*, *Loxoconcha guttata*, *Cythere pellucida*.

7. The grey sand merges into fine red glacial sand, a deposit which is largely developed all around Belfast. It is very barren in organic remains, the only fossils detected being two Foraminifera and two Ostracoda:—*Polystomella striato-punctata*, *Rotalia Beccarii*, *Cythere pellucida*, *Loxoconcha guttata*. This sand, which contains occasional clayey layers, had a thickness of about four feet, and rested on

8. Very fine tough red clay, of glacial age, the base of which was not

reached in the deepest excavation at the Dock—the foundation of the Rudder Well, over fifty feet below high water mark—although fifteen feet of it had then been passed through. No organic remains were discovered here, but this was probably due to the small sample submitted for examination.

As regards the microscopic fossils of these beds, it may be remarked that of the 104 species of Foraminifera recorded from the Post-tertiary deposits of the North-east of Ireland, by Mr. Joseph Wright,* the Alexandra Dock sections yielded forty species, their distribution being as follows:—Estuarine Clay, 40; sandy layer overlying peat, 4; grey sand under peat, 5; red sand, 2. Of twenty species of Ostracoda, all occurred in the blue clay—one in the sandy layer above-mentioned, two in the grey sand, and two in the red sand. One species of each of these orders was found in every deposit throughout—*Rotalia Beccarii* and *Loxoconcha guttata*.

If we now turn to the section at the outer entrance of the Dock, some 600 feet north of the one just described, some striking differences will be noticed. At the west side of the entrance basin the Estuarine Clay is only four feet thick, and below it is one foot of yellowish clay, which represents the bed of peat. This rests directly upon the fine red sand, the surface of which is here twelve feet higher than at the upper end of the works. At the east side, while making excavations for the inlet culvert, an interesting section was exposed (see Figure 2). Beneath some feet of clay and sand was a bed of coarse blackish sand, with abundance of shells, at the base of which were some two or three inches of almost pure shells. In this layer *Littorina litorea* was in great abundance, along with *Cardium edule*, *Mytilus edulis*, *Lucinopsis undata*, and *Thracia convexa*—some littoral and some deep-water forms, it will be noted. This mixture of species is curious, but I think there can be little doubt that the five to twenty fathom shells which occur here in profusion were washed out of the upper clay. The faunas of the two beds (the sand and upper clay) are remarkably similar, considering the very different conditions under which they must have been laid down; but a closer examination showed me that the deep-water species in the yellow sand were almost confined to its lowest zone, which abounds in the species that especially characterise the upper division of the Estuarine Clay, which lies immediately below it. A fine valve of the rare *Cardium Norvegicum* occurred here, several examples of *Utriculus obtusus*, and a single specimen of *U. mammillatus*, which is new to the Clays. Immediately below the shell layer is the Estuarine Clay, which at this point is only two feet thick. The deposit is very sandy, except at its upper surface, and is replete with species which have lived and died in what was then the sandy bottom of a bay several fathoms deep. Full-sized examples of the large *Lutraria elliptica* are of constant occurrence, along with large specimens of *Mya truncata*, and *Thracia convexa*, *Solen vagina*, and *Tapes pullastra*; of these *Mya* and *Tapes* are the only species now found living in the waters of our Lough. A rare and

*Wright—"Post-tertiary Foraminifera of the North-east of Ireland."—Proc. Belfast Naturalists' Field Club, Vol. I., Appendix V.

interesting specimen which I found here consisted of a large valve of *Cyprina Islandica*, to the interior face of which a full-sized Oyster was adhering, its shell fashioned to the shape of the *Cyprina*, and the other valve was lying close at hand. This tells of a slow rate of accumulation of the deposit. The *Cyprina* lived and died, and the valves of its shell in time broke asunder. Then the Oyster came and settled in the untenanted house of its predecessor, and it grew and flourished before the slow rain of fine mud buried both in a quiet grave. *Pholas crispata* and *P. candida* occur frequently; and a single specimen of *Pholas dactylus*, new to our Estuarine Clays, was observed. At the base of the bed, where it is quite sandy, there is abundance of *Cardium edule* —this stratum evidently corresponds with the lower clay of the first section. Below this we come directly upon the red sand; there is no trace of the peat bed. The sand is nearly twenty feet in thickness, and rests on the red clay.

It is interesting to compare the sections above described with other sections in the Lagan Estuary which have been examined by local geologists. The beds exposed when Spencer Basin was in course of construction, on the opposite side of the river, which were so thoroughly examined by Mr. Stewart, consisted simply of some twenty feet of Estuarine Clay, which he divides into three well-defined zones:—

1. Surface clays; abounding in littoral species.
2. Zone of *Thracia convexa;* characterised by shells which live in five to ten fathoms of water.
3. *Scrobicularia* zone; in which littoral species again predominate.

The physical and palæontological differences between the two latter were more marked than at Alexandra Dock; the beds of peat and sand were not exposed.

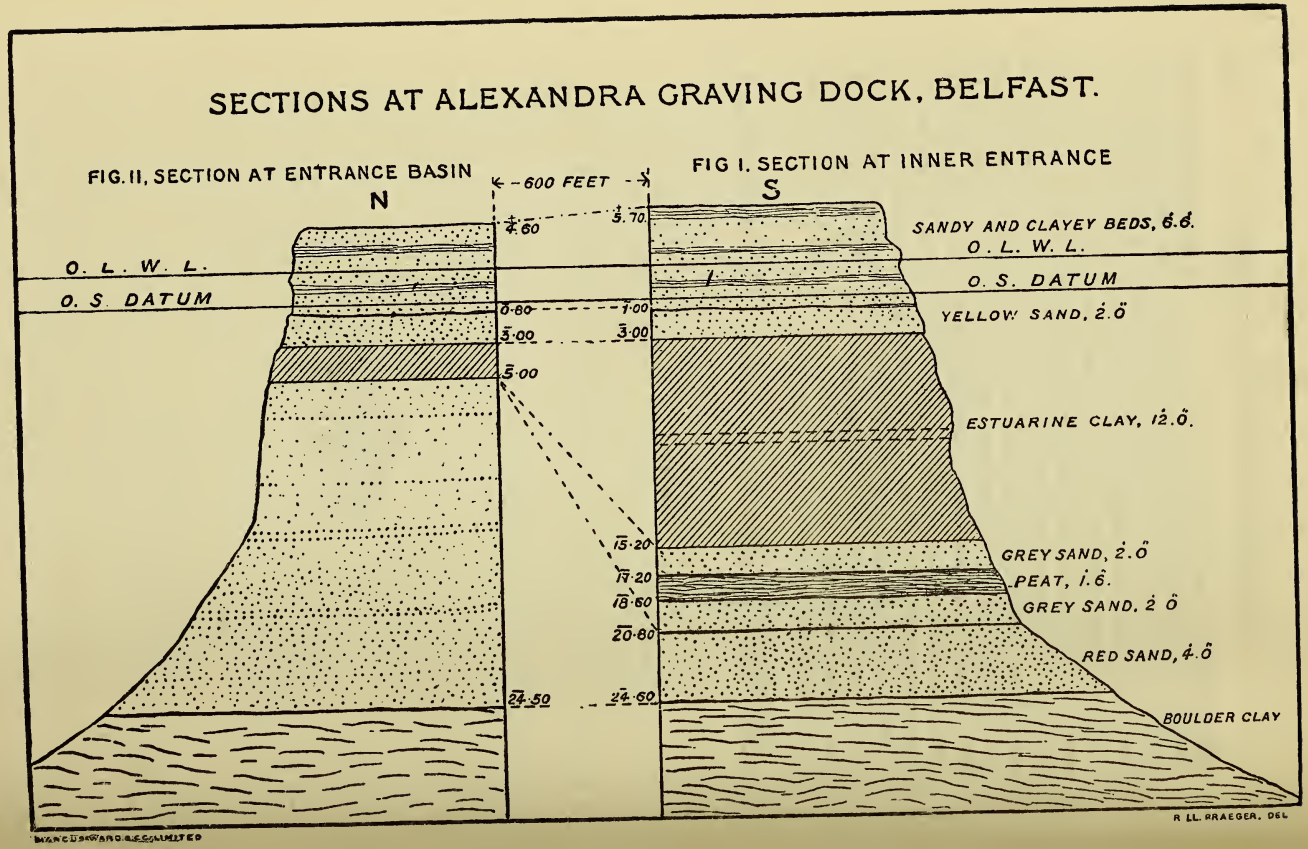
Borings at King Street, in the centre of the town, under the superintendence of Mr. Wm. Swanston, F.G.S., showed a depth of no less than twenty-eight feet of Estuarine Clay, at the base of which was a layer containing many twigs and hazel nuts. Next came twenty-four feet of fine running sand, which yielded on examination four species of Foraminifera, two of these being the two forms obtained in the red sand at the Dock. Beneath this was fifty feet of very fine red Boulder Clay, in which two Foraminifera were found to occur very sparingly, namely:—*Rotalia Beccarii*, and *Polystomella striato-punctata*, the same species which formed the only fossils of the red sand in the Dock sections. The fine clay rested on Boulder Clay, as it usually occurs in our neighbourhood, 100 feet in thickness, and abounding in Foraminifera, underlying which were the sandstones of the New Red.

At Sydenham Railway Station a different state of things may be noticed. We have only a couple of feet of Estuarine Clay, replete with the shells of species which live between tide-marks, its upper surface being about three feet above high-water mark, or sixteen feet higher than the top of the Estuarine Clay at the Dock. Then comes a foot of yellow sand, at the base of which is a narrow zone crowded with the crumbling remains of littoral species. This

rests, at different points, on fine red sand, gravel, or fine red clay; but before we have reached low-water level, we come upon the coarse Boulder Clay with pebbles, which at this place is therefore some ninety feet higher than in the Lagan Valley a mile to the westward, as shown by the King Street borings.

This concludes my brief notice of the Post-pliocene deposits of the Lagan Estuary. The Belfast beds have now been pretty well examined, and our knowledge of them is tolerably complete; but there is still an ample field for research in the similar clays which are to be found in almost all our loughs and bays; and it is to be hoped that other members of our Club will devote some of their time and attention to these interesting deposits—the latest page of the great mysterious volume of geological history. The clay at Magheramorne is famous for the profusion of Foraminifera, some of them of great rarity, which it yields,* and its richness in large fossils is apparent from the fact that during one visit—my only visit to it—no less than seventy-one species of fossils were noted, Microzoa excluded. Further examination of this deposit will without doubt result in considerable additions to this number.

* See Wright—"Post-tertiary Forams., N.E. Ireland," Proceedings Belfast Naturalists' Field Club, Vol. I., Appendix II.


SECTIONS AT ALEXANDRA GRAVING DOCK, BELFAST.
FIG. II, SECTION AT ENTRANCE BASIN
N
FIG I. SECTION AT INNER ENTRANCE
S
← 600 FEET →
O. L. W. L.
O. S. DATUM
4.60
3.70
0.80
1.00
3.00
3.00
5.00
15.20
17.20
18.60
20.80
24.50
24.60
SANDY AND CLAYEY BEDS, 6.6.
O. L. W. L.
O. S. DATUM
YELLOW SAND, 2.0
ESTUARINE CLAY, 12.0.
GREY SAND, 2.0
PEAT, 1.6.
GREY SAND, 2 0
RED SAND, 4.0
BOULDER CLAY
R. LL. PRAEGER, DEL.

In the following list of 186 species and varieties found at Alexandra Dock, I have employed the term "top clays" to designate the clayey and sandy beds which formed the highest and most recent deposit. "Upper clay" signifies the upper or deep-water zone of the Estuarine Clay, "Lower clay" the underlying littoral deposit. On account, perhaps, of its less interesting and less varied fauna, the lower clay was not so thoroughly examined as the zone above, and it is probable that some of the species recorded here as from the upper clay alone, occurred also in the lower bed.

I have to acknowledge much kind assistance rendered by Mr. S. A. Stewart, F.B.S.E., in the identification of critical species; by Mr. Joseph Wright, F.G.S., who catalogued the Microzoa of the deposits; and by Professor Cunningham, M.D., of Queen's College, who identified the vertebrate remains.

LIST OF FOSSILS

OBSERVED IN THE ESTUARINE CLAYS AT THE ALEXANDRA DOCK, BELFAST.

NOTE.—The nomenclature of the Mollusca is that adopted by J. Gwyn Jeffreys in his Manual of British Conchology. The Foraminifera are named according to H. B. Brady's Report on the Foraminifera of the "Challenger" Expedition; the Ostracoda in accordance with Dr. G. S. Brady's Report on the "Challenger" Ostracoda.

Species marked (*) are additions to the Estuarine Clay fauna of the North of Ireland; those marked (†) are new to the Belfast deposit.

* **Cervus elaphus,** *Linn.*

A dorsal vertebra, right radius, and posterior right rib of the Red Deer occurred at different spots on the upper surface of the peat bed.

* **Sus scrofa,** *Linn.*

Two portions of the lower jaw of a large Wild Boar, with teeth and both tusks, and at another place a single tusk, were found in a position similar to the Red Deer remains.

Helix nemoralis, *Müll.*
Two specimens of this land shell occurred in the top clays.

Patella vulgata, *Linn.*
Yellow sand, very rare, and much worn. (One specimen, *Grainger*).

* **Helcion pellucidum,** *Linn.*
Several young specimens in the upper clay.

Fissurella Græca, *Linn.*
Very rare; a single specimen in the yellow sand.

* **Capulus Hungaricus,** *Linn.*
Upper clay, one specimen.

Trochus magus, *Linn.*
In the yellow sand and upper clay, very rare.

Trochus cinerareus, *Linn.*
Very frequent, except in the lower clay, where it did not occur.

† **Trochus umbilicatus,** *Mont.*
Upper clay, rare, and of small size.

Lacuna divaricata, *Fabr.*
Very frequent, especially in the upper clay.

Littorina obtusata, *Linn.*
Frequent throughout.

Littorina obtusata, *var.* **æstuarii,** *Jeff.*
Two examples in the upper clay.

Littorina rudis, *Maton.*
Frequent in the upper and lower clays. (Scarce, *Stewart*).

Littorina rudis, *var.* **tenebrosa,** *Mont.*
Upper clay, one specimen.

Littorina litorea, *Linn.*
Common throughout the deposits.

Rissoa inconspicua, *Ald.*
Common, and generally distributed. Now quite extinct in our lough.

Rissoa membranacea, *Adams.*
With the last species.

Rissoa violacea, *Desm.*
Very frequent in the upper and lower clay.

† **Rissoa striata,** *Adams.*
In the upper clay, not uncommon.

Rissoa vitrea, *Mont.*
With the last, but rare.

Hydrobia ulvæ, *Penn.*
Occurs throughout the deposits; in abundance in the most recently formed bed.

Turritella terebra, *Linn.*
Frequent; attains a large size in the upper clay.

Scalaria Turtonæ, *Turt.*
Of constant occurrence in the upper clay. Not now living in Belfast Lough.

† **Aclis supranitida,** *S. Wood.*
In the upper clay, rare.

Odostomia lactea, *Linn.*
This elegant little shell is not uncommon in the upper clay and yellow sand.

Eulima bilineata, *Ald.*
A single specimen in the lower clay. (One specimen, *Grainger*).

Natica catena, *Da Costa.*
One small example in the lower clay.

Natica Alderi, *Forbes.*
Upper clay, very frequent.

Aporrhais pes-pelecani, *Linn.*
Upper and lower clay, and yellow sand, abundant, especially in the first.

Cerithium reticulatum, *Da Costa.*
In the greatest profusion throughout.

Purpura lapillus, *Linn.*
In different beds, but very uncommon.

Buccinum undatum, *Linn.*
Plentiful in all but the top clays.

Murex erinaceus, *Linn.*
Very uncommon in the deposits, but of large size.

Fusus antiquus, *Linn.*
A few specimens, of large size, occurred.

* **Fusus gracilis,** *Da Costa.*
In the yellow sand, extremely rare.

Nassa reticulata, *Linn.*
A common shell in the upper clay and yellow sand.

Nassa pygmæa, *Lamk.*
Very abundant in the upper clay, but does not occur in either the lower clay or top clay. See Mr. Stewart's note in his list of Estuarine Clay Fossils.

Pleurotoma brachystoma, *Phil.*
Two specimens in the upper clay.

Pleurotoma septangularis, *Mont.*
I found one specimen in the lower clay.

Cypræa Europæa, *Mont.*
Our little cowry is extremely rare. The upper clay yielded one specimen, and the yellow sand another.

* **Cylichna cylindracea,** *Penn.*
In the upper clay, very rare.

* **Utriculus mammillatus,** *Phil.*
A fragment of a shell of this tiny species in the yellow sand made me look for more, and I discovered a perfect specimen in the upper clay.

† **Utriculus obtusus,** *Mont.*
In the upper clay and yellow sand, but few and far between.

Utriculus hyalinus, *Turt.*
One specimen was discovered inside the closed valves of a *Tapes*, in the lower clay. (Plentiful in the Belfast bed, *Stewart*).

Acera bullata, *Müll.*
In profusion in the upper clay, but so fragile that it is well nigh impossible to obtain a perfect specimen.

Actæon tornatilis, *Linn.*
One dilapidated specimen in the upper clay.

Scaphander lignarius, *Linn.*
Lower clay, very rare.

Philine aperta, *Linn.*
Very frequent in the upper clay and yellow sand.

* **Philine scabra,** *Müll.*
In the lower clay, very rare.

† **Melampus bidentatus,** *Mont.*
Upper clay, very scarce.

Anomia ephippium, *Linn.*
Quite abundant in the upper and lower clay and yellow sand, n every variety of shape and size. I obtained one beautiful specimen adhering to the flat valve of a large *Pecten maximus*, with ridges on both valves as high and regular as those on the *Pecten*, and measuring four inches in diameter.

* **Anomia aculeata,** *Müll.*
Two or three specimens occurred in the yellow sand.

Anomia patelliformis, *Linn.*
Very rare. One specimen was obtained in the yellow sand. (Rare, *Grainger*).

* **Anomia patelliformis,** *var.* **striata,** *F. & H.*
Yellow sand, a single valve.

Ostrea edulis, *Linn.*
The Oyster is abundant throughout the deposits. Fine examples occur in numbers in the upper clay, the colours in the interior as vivid as if the animal had inhabited the shell but yesterday.

Ostrea edulis, *var.* **hippopus,** *Lamk.*

In the upper clay, frequent, and of immense size. One specimen weighed over a pound and three quarters.

Pecten varius, *Linn.*

Single valves not uncommon, perfect specimens rare.

Pecten opercularis, *Linn.*

Fine examples are scattered plentifully through the upper clay; in the yellow sand single valves are abundant.

Pecten maximus, *Linn.*

In the upper clay, here and there, regular layers of the large shells of this species and of the *Ostrea* were observed.

* **Pecten pusio,** *Linn.*

One valve of this deformed-looking species was found in the lower clay. A rare shell in our present waters, and not hitherto observed in the Estuarine Clays.

Mytilus edulis, *Linn.*

The Mussel is plentiful in the top clays and yellow sand, reaching in the latter its full limit of size. In the upper clay it is unknown, but appears again in the lower clay in a crumbling condition.

* **Mytilus edulis,** *var.* **pellucidus,** *Penn.*

Examples of this perhaps not distinct variety are frequent.

Mytilus modiolus, *Linn.*

Not at all common. I obtained one perfect specimen and a few fragments in the upper clay.

Mytilus Adriaticus, *Lamk.*

Rare; a few young shells in the upper clay.

Nucula nucleus, *Linn.*

Diffused through the upper clay.

* **Arca tetragona,** *Poli.*

One complete specimen in the bed of yellow sand.

Montacuta bidentata, *Mont.*

This tiny bivalve is scattered plentifully through the upper clay and yellow sand.

Montacuta ferruginosa, *Mont.*

In the upper clay, very rare.

Lucina borealis, *Linn.*

In the uppermost deposit at the Dock large specimens of this shell occurred, but only as single valves.

Axinus flexuosus, *Mont.*

Generally diffused, and abundant.

Cardium echinatum, *Linn.*
In the deep-water clay fine specimens of this beautiful species are abundant. Worn single valves are common in the overlying yellow sand.

Cardium exiguum, *Gmel.*
Diffused through the deposits, but scarce, and usually as single valves.

† **Cardium nodosum,** *Turt.*
The upper clay yielded one small valve of this species, so rare as an Estuarine Clay fossil.

Cardium edule, *Linn.*
In the top clays and yellow sand abundant and large, not uncommon in the upper clay, and in the lower clay very abundant, but of small size.

Cardium edule, *var.* **rusticum,** *Chemn.*
Some very oblique valves probably belong to this variety.

Cardium Norvegicum, *Speng.*
This fine shell is very rare. A single valve was discovered in the upper clay, and another in the blackish sand of the outer entrance section. (One valve, *Grainger*. Two or three valves, *Stewart*).

Cyprina Islandica, *Linn.*
Beyond the complete specimen mentioned in my paper (p. 34), the only evidence of the occurrence of this large shell was the fragments of one great valve, which had been some five inches in breadth, which I found in the yellow sand. (One perfect specimen, *Stewart*).

Venus lincta, *Pult.*
Rare; a few single valves scattered through the top clays and yellow sand.

* **Venus exoleta,** *Linn.*
Very rare; three single valves occurred in the yellow sand.

Venus Gallina, *Linn.*
Distributed through the upper and lower clays, but of small size.

* **Venus fasciata,** *Da Costa.*
A single valve in the yellow sand.

Tapes aureus, *Gmel.*
Frequent, and scattered throughout.

Tapes aureus, *var.* **ovata,** *Jeff.*
Very rare. (Not uncommon, *Stewart*).

Tapes pullastra, *Mont.*
In the upper clay and yellow sand, where it attains an unusual size. (Frequent, especially in the lower zone, *Stewart*).

Tapes decussatus, *Linn.*
In the yellow sand very large valves are frequent. In the upper clay it is uncommon, but large; and in the lower clay it occurs in profusion, but small.

* **Tapes virgineus,** *Linn.*

Very rare. I found two worn valves in the yellow sand.

Lucinopsis undata, *Penn.*

In great abundance, and very large, in the upper clay, of which it is one of the most characteristic fossils. Large single valves occur in numbers in the shelly layer at the base of the yellow sand, lying on the upper surface of the clay.

Tellina Balthica, *Linn.*

In profusion, but of small size, in the top clays. Abundant and large in the lower clay, particularly in the basal portion.

Tellina tenuis, *Da Costa.*

Very rare. A few specimens in the newest deposit.

Psammobia Ferröensis, *Chemn.*

Single valves occasionally observed.

* **Mactra solida,** *var.* **elliptica,** *Brown.*

One valve in the lower clay.

Mactra subtruncata, *Da Costa.*

Very frequent, but small and of variable form, in the deposits.

Lutraria elliptica, *Lamk.*

Over the greater portion of the excavations young specimens only occurred, but, as previously mentioned, near the outer entrance, where the clay thinned out to a depth of only a couple of feet, full-grown specimens were abundant, covered with a rich golden-brown epidermis, and measuring up to six inches in breadth.

Scrobicularia alba, *Wood.*

In extraordinary profusion in the upper clay. Much rarer in both the underlying clay and the yellow sand.

Scrobicularia piperata, *Bellonius.*

In countless thousands in the lower clay. Almost entirely absent from the other beds.

Solen pellucidus, *Penn.*

Frequent in the deep-water deposit.

Solen vagina, *Linn.*

In the upper clay and yellow sand, not uncommon. It is very strange how this species has disappeared from our bay, and how *S. siliqua*, which is unknown in the Estuarine Clays, has taken its place.

Solen ensis, *Linn.*

With the last, but rarer.

Thracia papyracea, *Poli.*

Upper clay only, not rare.

Thracia convexa, *W. Wood.*
Very characteristic of the upper clay, in which it is found in abundance. Common also with *Lucinopsis* in the shell layer which rests on the upper clay. Quite absent from the lower and top clays.

Corbula gibba, *Olivi.*
Common in the upper clay, frequent in the lower bed.

Mya arenaria, *Linn.*
Top clays only, where it is in great abundance.

Mya truncata, *Linn.*
Plentiful throughout the upper clay, and very large. Single valves in the yellow sand.

Pholas candida. *Linn.*
With the two following species, this boring shell occurred only in the Pholad zone, between the upper and lower clay, where it was abundant.

Pholas crispata, *Linn.*
Perfect specimens, of most unusual dimensions (see p. 31), were observed all over the area of excavation, but only in the zone above-mentioned.

* **Pholas dactylus,** *Linn.*
A single complete specimen in the Pholad layer.

Teredo Norvegica, *Speng.*
Fragments of the calcareous tubes of this species were found in the upper clay.

* **Echinus sphæra,** *Müll.*
Spines of this large Echinoderm in the upper clay.

Echinus miliaris, *Leske.*
This "urchin" is rather common in the clays, but is of small size. Mr. Stewart mentions a thickly-packed layer of the shells of this species near the surface of the upper clay at Spencer Basin.*

Amphidotus cordatus, *Penn.*
The fragile shells of this "heart-urchin" are rather common in the upper clay, and its spines occur in profusion.

* **Cancer pagurus,** *Leach.*
Fragments of a large claw in the yellow sand.

* **Carcinus mænas,** *Leach.*
I twice got remains of this crab in the upper clay.

* **Portunus depurator,** *Leach.*
Top clays, rare.

Serpula triquetra, *Linn.*
Very frequent on shells all through.

* See Footnote, page 29.

Serpula vermicularis, *Linn.*
Not uncommon in the deposits.

Cornuspira involvens, *Reuss.*
Frequent in the Estuarine Clay.*

† **Biloculina ringens,** *Lamk.*
Estuarine Clay, rare.

† **Biloculina depressa,** *d'Orb.*
Estuarine Clay, very rare.

Miliolina oblonga, *Montagu.*
In the blue clay, rare.

Miliolina seminulum, *Linn.*
Frequent in the blue clay; also occurred, but sparingly, in the grey sands, both above and below the peat bed. (In great abundance, *Stewart.* Rare, *Wright*).

† **Miliolina secans,** *d'Orb.*
In the blue clay, rare.

Miliolina subrotunda, *Montagu.*
Blue clay, rather frequent. (Very rare, *Wright*).

* **Miliolina sclerotica,** *Karrer.*
Blue Clay, frequent.

Trochammina squamata, *J. & P.*
Very rare in the Estuarine Clay.

Trochammina macrescens, *Brady.*
Estuarine Clay, very scarce.

Trochammina inflata, *Montagu.*
Estuarine Clay, frequent.

Bulimina pupoides, *d'Orb.*
Common in the Estuarine Clay, rare in the basal sandy portion.

Bulimina ovata, *d'Orb.*
Frequent in the blue clay.

Bulimina elegantissima, *d'Orb.*
Abundantly distributed through the blue clays.

Bulimina marginata, *d'Orb.*
With the last, and equally abundant.

Virgulina Schreibersiana, *Czjzek.*
Blue clay, frequent.

† **Bolivina punctata,** *d'Orb.*
Generally diffused through the blue clay.

* I regret that in the case of the Foraminifera and Ostracoda I did not take care to obtain samples of both the upper and lower clays, and have them examined separately. Samples of the clays were closely scrutinized, but the fossils of both the littoral and deep water beds were grouped together under the head of "Estuarine Clay," or "Blue Clay."

Bolivina plicata, *d'Orb.*
Very frequent in the blue clay. (Rare, *Wright*).

* **Bolivina difformis,** *Will.*
In the blue clay, rare.

Lagena lævis, *Montagu.*
Estuarine Clay, frequent.

* **Lagena lævis,** *var.* **clavata,** *d'Orb.*
Estuarine Clay, frequent.

Lagena striata, *d'Orb.*
Frequent throughout the blue clay.

† **Lagena gracilis,** *Will.*
One or two specimens only, in the blue clay.

Lagena semistriata, *Will.*
Rather more frequent than the last.

† **Lagena hexagona,** *Will.*
Blue clay, very scarce.

* **Lagena lævigata,** *Reuss.*
A few examples in the grey sand under the peat.

* **Lagena lævigata,** *var.* **lucida,** *Will.*
Frequent in the Estuarine Clay.

* **Lagena Orbignyana,** *Seg.*
Blue clay, very scarce.

† **Nodosaria communis,** *d'Orb.*
A single specimen in the blue clay.

† **Nodosaria scalaris,** *Batsch.*
Very sparingly distributed.

† **Cristellaria rotulata,** *Lamk.*
Blue clay, very rare.

Polymorphina lactea, *W. & J.*
A few examples in the Estuarine Clay.

† **Uvigerina angulosa,** *Will.*
Not at all common.

† **Globigerina inflata,** *d'Orb.*
Very rare, one specimen only.

Discorbina globularis, *d'Orb.*
Not uncommon in the blue clay. (Very rare, *Wright*).

† **Planorbulina Mediterranensis,** *d'Orb.*
Blue clay, frequent.

Truncatulina lobatula, *W. & J.*
Blue clay, scarce.

Rotalia Beccarii, *Linn.*

Abundant in the blue clay, and in the greatest profusion in the basal sandy layer. In the grey sand below the peat it was of frequent occurrence, and in the red glacial sand a few much-worn specimens were observed.

† **Rotalia nitida,** *Will.*

In the Estuarine Clay, very rare.

Nonionina depressula, *W. & J.*

Common in the blue clay. In the grey sand overlying the peat it was very scarce, but in the grey sand under the peat it again occurred abundantly.

Polystomella crispa, *Linn.*

Of frequent occurrence.

Polystomella striato-punctata, *F. & M.*

In the Estuarine Clay abundantly; also in the red sand, where it was extremely rare.

Pontocypris mytiloides, *Norman.*

Blue clay, rare.

Cythere pellucida, *Baird.*

Abundant in the blue clay and in the sandy layer at its base; very rare in the red sand. Abundant in the lough at the present time.*

Cythere crispata, *Brady.*

Plentiful in the blue clay; very rare in our present waters.

Cythere viridis, *Müller.*

In the blue clay, very scarce. (Throughout the deposits, *Brady, Crosskey, and Robertson*). †

Cythere lutea, *Müller.*

Blue clay, not common.

Cythere convexa, *Baird.*

Blue clay, very rare.

Cythere villosa, *G. O. Sars.*

Very rare. (Throughout the clays, *Brady, Crosskey, and Robertson*).

Cythere concinna, *Jones.*

Common in the Estuarine Clays.

Cythere tuberculata, *G. O. Sars.*

Like the last, common.

Cythere Dunelmensis, *Norman.*

In the Estuarine Clay, not unfrequent. Extremely rare in our present waters.

* For the present distribution of Ostracoda in our waters, see Malcomson, "Recent Ostracoda of Belfast Lough."—Proc. Belfast Naturalists' Field Club, Vol. II., Appendix IX

† Brady, Crosskey, and Robertson—Monograph of the Post-tertiary Entomostraca of Scotland, p. 102.

Cythere antiquata, *Baird.*
Frequent in the blue clay.

Cythere Jonesii, *Baird.*
Diffused through the blue clay.

Cythere Whiteii, *Baird.*
Blue clay, rare. Not now found in the lough.

* **Loxoconcha guttata,** *Norman.*
Plentiful in the Estuarine Clay. It also occurred sparingly in the sand both above and below the peat bed, and in the red sand was very rare.

Loxoconcha impressa, *Baird.*
Not uncommon in the blue clay.

Cytherura nigrescens, *Baird.*
In the blue clay, abundant.

Cytherura striata, *G. O. Sars.*
Not at all common.

Cytherura undata, *G. O. Sars.*
Very scarce in the clays.

Paradoxostoma ensiforme, *Brady.*
Blue clay, frequent.

* **Paradoxostoma Fischeri,** *G. O Sars.*
Rare in the Estuarine Clay. Very rare in our present waters.

Pinus sylvestris, *Linn.*
Cones and branches of the Scotch Fir occurred in the submerged peat.

Quercus Robur, *Linn.*
A few boughs in the peat.

Alnus glutinosa, *Gaert.*
Occasional seed vessels in the peat.

Salix alba, *Linn.*
Boughs and stumps, which, I believe, belonged to this species, were abundant in the peat.

Corylus Avellana, *Linn.*
Hazel nuts were of frequent occurrence in the peat, and were quite plentiful in certain thin layers in the top clay.

Iris pseud-acorus, *Linn.*
Leaves and fruit in the peat.

Zostera marina, *Linn.*
The Grass-wrack is very abundant in the lower clay.

Pteris aquilina, *Linn.*
Rhizomes of the Bracken were not uncommon in the peat bed.

In order to render this a complete catalogue of the Fossils of the Belfast Clays, I append a list of all species which have been recorded from these beds by other observers, which did not occur at the Alexandra Dock. These, added to the preceding, bring up the total number of fossils found in the Belfast deposits to 235 species and varieties.

Helix rotundata, *Linn.*
One specimen, *Grainger.*

Zonites nitidulus, *Drap.*
Two specimens, *Grainger.*

Tectura virginea, *Müll.*
Very rare (one young specimen), *Stewart.*

Lacuna crassior, *Mont.*
Was distributed in some numbers, *Grainger.*

Lacuna pallidula, *Da Costa.*
Scarce, *Stewart.*

Odostomia pallida, *Mont.*
Was met with sparingly, *Grainger.*

Odostomia acuta, *Jeff.*
Rare, *Stewart.*

Odostomia indistincta, *Mont.*
Rare, *Stewart.*

Odostomia interstincta, *Mont.*
Very rare, *Stewart.*

Defrancia gracilis, *Mont.*
Very rare, one specimen only, *Stewart.*

Pleurotoma costata, *Donovan.*
One specimen, *fide Grainger.*

Pleurotoma rufa, *Mont.*
"As a post-glacial or quaternary fossil I have identified *P. rufa* from only the Belfast deposit."—*J. G. Jeffreys.*

Pleurotoma turricula, *Mont.*
Rare, *Stewart.*

Cylichna nitidula, *Lov.*
One shell, *Stewart.*

Lima hians, *Gmel.*
Very rare, *Stewart.*

Mytilus Adriaticus, *var.* **ovalis,** *Sowerby.*
"Occurred in excavating a channel in Belfast Harbour."—*J.G. Jeffreys*

Modiolaria marmorata, *Forbes.*
Very rare, *Stewart.*

Leda minuta, *Mull.*
A single valve, *Grainger.*

Cyamium minutum, *Fabr.*
Rare, *Stewart.*

Tellina squalida, *Pult.*
Thompson—Belf. Mus. Coll.

Psammobia vespertina, *Chemn.*
A single valve, *Grainger.*

Mactra truncata, *Mont.*
Scarce, *Stewart.*

Lutraria oblonga, *Chemn.*
One large specimen, *fide Grainger.*

Solecurtis antiquatus, *Pult.*
A single specimen, *fide Grainger.*

Thracia pubescens, *Pult.*
One specimen, *Grainger.*

Panopea plicata, *Mont.*
Plentiful in one narrow zone, *Stewart.*

Saxicava rugosa, *Linn.*
Rare, *Stewart.*

Saxicava rugosa, *var.* **arctica,** *F. & H.*
Rare, *Grainger.*

Gastrochæna dubia, *Penn.*
Very rare, *Grainger.*

Creusia verruca, *Leach.*
Two or three specimens, *Grainger.*

Pectinaria Belgica, *Pall.*
One specimen, *Grainger.*

Terebella conchilega, *Pall.*
Grainger.

Miliolina trigonula, *Lamk.*
Common, *Stewart.* Rare, *Wright.*

Spiroloculina limbata, *d'Orb.*
Rare, *Stewart.*

Spiroloculina planulata, *Lamk.*
Very rare, *Stewart.*

Textularia sagittula, *Defrance.*
Rare, *Wright.*

Textularia variabilis, *Will.*
Common, *Wright.*

Verneuilina polystropha, *Reuss.*
Very rare, *Stewart.*

Lagena gracillima, *Seguenza.*
Rare, *Wright.*

Cythere albomaculata, *Baird.*
Rare, *Stewart.*

Cythere pulchella, *Brady.*
Near the surface of the clays, *Brady, Crosskey, and Robertson.**

Cytheridea elongata, *Brady.*
Surface of clays, *B., C., and R.*

Loxoconcha tamarindus, *Jones.*
In the oldest and newest zones of the clays, *B., C., and R.*

Xestoleberis depressa, *G. O. Sars.*
B., C., and R.

Xestoleberis aurantia, *Baird.*
B., C., and R.

Cytherura similis, *G. O. Sars.*
Lowest zone of the clays, *B., C., and R.*

Cytherura affinis, *G. O. Sars.*
B., C., and R.

Cytherura gibba, *Müller.*
Lowest zone, *B., C., and R.*

Cytherura acuticostata, *G. O. Sars.*
Uppermost zone of the clays, *B., C., and R.*

Paradoxostoma variabile, *Baird.*
B. C. and R.

* Monog. Post-tert. Entom., Scotland, p. 102.

18 JUN. 90

APPENDIX III.

VOL II.

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THE MARINE SHELLS

OF

THE NORTH OF IRELAND.

BY R. LLOYD PRAEGER, B.E., B.A.

NATURAL HISTORY

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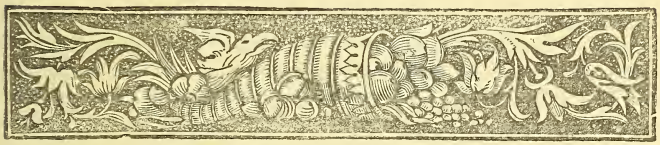

The Marine Shells of the North of Ireland.

——(:-:)——

INTRODUCTION.

IN compiling the following list of the recent Marine Shells of the North of Ireland, the object of the writer has been to bring together, and present in simple and accessible form, the information which we possess regarding this attractive branch of local zoology. The literature bearing on the subject consists of a number of papers and notes scattered through various publications, some of them not easily obtainable by the enquirer, while the matter which they contain is generally in such a form that it is not easy to discover immediately what shells have been found in our district, and in what localities. Such, too, is the difference of nomenclature in the works referred to, that it is a task of some difficulty to compare and correlate the lists of *Mollusca* which they contain ; and in Thompson's works, indeed, which were published before the value of systematic nomenclature was appreciated as it is now, it is occasionally very troublesome to find what species is intended. In the list which follows, the names adopted by J. Gwyn Jeffreys in his "British Conchology"—the standard work on the subject—are employed, and where a species is referred to by any of the authors quoted under a different name, such synonym is appended in parenthesis.

The sources of information which have been utilised in preparing the present paper are as follows :—

I. "A History of British Mollusca," by Messrs. Forbes and Hanley. This work supplies a few North of Ireland stations for species, other than those taken from Thompson's work, to be mentioned immediately.

II. "The Natural History of Ireland," by William Thompson: vol. IV., 1856. In this work 350 species and varieties of Marine Shells are recorded as Irish, under the names which were in use prior to the publication of Forbes and Hanley's treatise, of which some 240 are noted from localities in Ulster; the majority of these notes are given *verbatim* in the following pages. Mr. Thompson's earlier list of Irish Shells, which appears in his "Report on the Fauna of Ireland: Division Invertebrata," in the British Association Report for 1843, contains many species not to be found in the "Natural History of Ireland"; but it may be safely assumed that such were intentionally excluded from the latter work, for many Shells had been recorded as native on very insufficient grounds; and the writer has, therefore, thought it best to be guided by the "Natural History" alone, as it contains all the notes which Mr. Thompson considered thoroughly reliable.

III. The "Reports of the Belfast Dredging Committee," by George C. Hyndman, in the Reports of the British Association for 1857, '58, and '59. The following is a summary of the lists which these Reports contain:—

	Station.	Depth in Fathoms.	Species.
1857 Report.	1. Belfast Bay and Neighbourhood ...	0-100	205
	2. Turbot Bank	25-30	192
	3. Off Maiden Rocks	70-100	42
1858 Report.	1. 2 Miles off Ballygalley Head ...	15-25	52
	2. Cod Bank, 3m. N. of Muck I. ...	20	73
	3. Larne Lough, 1-2½m. from entrance....	4-5	26
	4. Brown's Bay, Island Magee ...	1-4	21
	5. S. of Maiden Rocks	20	45
	6. E. and S.E. of Maiden Rocks ...	70-90	95
	7. Turbot Bank	25-30	129
	8. Turbot Bank	25-30	18
	9. 2 Miles S.S.E. of Black Head ...	25	118
	10. "The Riggs" Bank, S.E. of Donaghadee	20	63
	11. 4 Miles S.S.E. of Black Head ...	15	79
	12. The Sound, Copeland Islands ...	12	40

1859 Report. An annotated list of additional species and additional localities, and a few corrections.

The Stations above are conveniently arranged in four groups, viz:—

1. Belfast Lough. This signifies the waters lying west of a line drawn from Orlock Point, in Co. Down, to Black Head, in Co. Antrim, and not exceeding 10 fathoms in depth.

2. Entrance of Belfast Lough. Under this head come a number of dredgings made around the entrance of the Bay, from Donaghadee on the Co. Down shore, northward as far as the great cliff-range of The Gobbins, in Island Magee, Co. Antrim. By far the most important of these, as far as results are concerned, are those made on the Turbot Bank, "a great submarine bank lying a short distance out from the cliffs called The Gobbins, and extending from the Isle of Muck across the entrance of Belfast Bay towards the Copeland Islands."* On this bank, which lies in from 25 to 30 fathoms of water, a number of rare and interesting species have been obtained, but almost all in a dead state, and it is to be noted that some of the Turbot Bank shells are very doubtfully recent, while a few are certainly fossil. Mr. Hyndman expresses the opinion that the majority of the shells are derived from the deep recess lying near the Maiden Rocks, a few miles to the northward, which will presently be mentioned; but it would appear probable that some submarine pleistocene deposit in the neighbourhood has also contributed to the rich store of *Testacea* which the Turbot Bank yields.†

3. Larne Lough. Mr. Hyndman's party made but one haul of the dredge in this lough; it yielded so little that apparently the scientists never revisited waters that gave so poor a return for their labours. This poverty in shells is the more remarkable when we take into consideration the extreme richness in *Mollusca* of the Estuarine Clays in that vicinity.

4. Off Larne. This term embraces a large number of stations, from Isle of Muck northward to Ballygalley Head, and out eastward to beyond the Maiden Rocks. The latter consist of a group of rocky islets lying some six miles from shore; on their seaward side the water deepens rapidly, and over a limited area a depth of 90 and 100 fathoms is reached. This abyss, which is very difficult to dredge on account of the rocky nature of the bottom and the strong currents that sweep over it, is the home of many rare species, and those who have successfully faced

* Hyndman, 1857 Report.

† The question of the origin of the Turbot Bank shells is one of much interest, and has not been satisfactorily settled. The opinion of the compilers of the Naturalists' Field Club "Guide to Belfast and the adjacent Counties," is worth recording:—"About 200 species of *Mollusca* have been enumerated from the Turbot Bank, many of them being of extreme rarity; but the majority occurring as dead shells only. It has been suggested that this bank is only a submarine fossil bed, and that a great portion of the shells are really relics of the glacial epoch. It is, however, quite as likely that they are accumulated on this bar by currents, and that they belong to species still living in the vicinity, on rocky bottoms where the dredge has little chance of picking them up."

the troubles attending dredging on such ground, at such a depth, have been rewarded with living examples of *Argiope cistellula*, *A. capsula*, *Propilidium ancycloides*, and other deep-sea treasures.

IV. "Report on the Marine Zoology of Strangford Lough, Co. Down, and corresponding part of the Irish Channel," by George Dickie, M.D., Professor of Natural History, Queen's College, Belfast, in the British Association Report for 1857. A summary of the lists here presented is as follows:—

Station.	Depth in Fathoms.	Species and Varieties.
1. Castle Ward Bay	20	102
2. Wellstream Bay	15	28
3. Upper part, ditto	4-8	43
4. Bay opposite Killyleagh	6	13
5. Centre of Lough	15-25	38
6. Gun Island, Irish Channel	7	8

Then follow lists of the *Testacea* of the open channel opposite the entrance of the Lough, divided into zones according to the distance from shore.

V. "British Conchology," by J. Gwyn Jeffreys, F.R.S., &c., 1863-9. This work contains, besides repetitions of many of Thompson's, Dickie's, and Hyndman's records, some notes of species obtained by the author, and also by Mr. Waller and Mr. Adair, on the North of Ireland coasts; those notes will be found under the respective species.

There are earlier works which contain references to North of Ireland *Mollusca*, but all reliable records of any importance are to be found repeated in the books cited above. During the long period that has elapsed since the publication of even the latest of these, though a good deal of dredging has been done by local scientists, very little has been added to the knowledge of our Marine Shells, attention having been chiefly concentrated on the interesting *Microzoa* which the earlier Naturalists had left almost untouched. Indeed, the only additional matter of which I have been able to avail myself is a few manuscript notes by Mr. S. A. Stewart, F.B.S.E., and the same by the present writer, while an examination of the shells contained in the cabinets of Mr. William Swanston, F.G.S., of Belfast, and Miss Richardson, of Portrush (to both of whom my best thanks are due), and of those in the local collection in the Belfast Museum, has yielded some additional stations for species.

Where practicable, I have preferred giving *verbatim* quotations from the authors quoted, in place of a general summary of their remarks.

Of the 404 British species contained in that portion of the Sub-Kingdom *Mollusca*, as described by Jeffreys, to which the present paper refers (*i.e.* the classes *Brachiopoda*, *Conchifera*, *Solenoconchia*, and *Gasteropoda* to the end of *Pleurobranchiata*), our district has yielded 291, or very nearly $\frac{3}{4}$—119 bivalves and 172 univalves—exclusive of such species as are importations or fossils, and which are printed inside brackets. On the whole, the Fauna has a northern aspect, since, of these 291 species, 36 are boreal forms, which live either not at all, or very sparingly, south of Britain, while only 12 are essentially southern, having been taken seldom or never north of the British coasts; the remaining 243 inhabit seas both north and south of our islands. As is to be expected from geographical considerations, the southern species frequent chiefly the western shores of the province, while the northern forms have been mostly taken on the eastern coast. Of the northern types, *Crenella decussata*, *Leda minuta*, *Tectura testudinalis*, *Emarginula crassa*, *Trichotropsis borealis*, and *Trophon truncatus*, will serve as examples—they have all been taken alive in our waters; while the following will serve as representatives of the southern forms which the district yields—*Modiolaria costulata*, *Crenella rhombea*, *Arca lactea*, *Trochus Duminyi*, *Natica sordida*, *Ovula patula*.

Only one species is, as a British shell, confined to our province—*Trochus Duminyi;* it occurs on the western coast, and is a southern shell, its foreign stations being all Mediterranean.

The *Testacea* of the counties of Antrim and Down may be considered as pretty well worked up, though the North of Antrim offers a good field that has been scarcely touched. County Londonderry contains extensive sandy beaches, which yield a large variety of species, that of Magilligan especially; here the observations have been chiefly made from shore, and dredgings in the deeper water might yield interesting results. I find no record whatever of any dredging in Lough Foyle. From the extensive coast-line of County Donegal, with its magnificent headlands and deep inlets and sandy bays, comes hardly a single note to enrich the list which follows. At Bundoran, indeed, in the extreme southwestern corner of the county, Mrs. Hancock made many finds, which she communicated to Thompson; and here Mr. Waller discovered a new British *Trochus*, *T. Duminyi*, whose only British station is still Bundoran; but beyond these, the conchology of the most northern county of Ireland still remains to be investigated, and will probably amply repay the investigator.

Mr. Thompson appears to have placed but light value on the *condition* (living or dead) of the shells which he found in his dredgings, or thrown up by the tide, and in many instances does not mention this point at all. In the present paper the writer perhaps has erred in the opposite extreme, and has placed undue importance on this point, but it does appear to him to be of interest and importance to know whether or not a shell has been taken living in the district. It is to be remembered, however, that the fact of a species not having been found living, is by no means positive proof that it no longer

inhabits a region. Many bivalves burrow deeply in sand and mud, and flourish out of reach of the naturalist's dredge. When they die, the shells come up to the surface, and are thus thrown on shore by the waves, or taken by the dredge, in a fresh state.

In conclusion, the writer expresses a hope that the following list may prove a reliable foundation for a more complete and extended paper on the Marine *Mollusca* of the North of Ireland, and that by showing the incompleteness of the record, it may encourage other workers to give some of their attention to this interesting subject.

ANNOTATED LIST OF SPECIES.

CLASS BRACHIOPODA.

The *Brachiopoda* are well represented in the district, as out of the six British representatives of the class, four live in our waters.

Terebratula caput-serpentis, *Linné.*

Not uncommon in the deeper water at the entrance to Belfast Lough, and off Larne, from the Copeland Islands to the Maiden Rocks, living in from 12 to 100 fathoms of water—Thompson (*T. aurita*), Hyndman, and others. Dickie obtained it alive at the entrance to Strangford Lough in 12-15 fathoms.

Argiope cistellula, *Searles Wood.*

"Living on stones as well as shells in the deeper water"—Hyndman, 1859 Report. Labels in the Belfast Museum Collection show that the Turbot Bank is the place intended.

Argiope capsula, *Jeffreys.*

Hyndman records this rare species (*sub Terebratula capsula*) as found living with the preceding, and Jeffreys, referring to the same station, says "Larne, Co. Antrim (Hyndman and J. G. J.)" The latter author also gives "off Portrush (Waller)."

Crania anomala, *Müller.*

Off Larne, and at the entrances to Belfast and Strangford Loughs, living in 12-90 fathoms—Thompson (*C. personata*), Hyndman, and Dickie.

CLASS CONCHIFERA.

ORDER LAMELLIBRANCHIATA.

Anomia ephippium, *Linné.*

Abundantly distributed throughout our waters, living in from 4 fathoms in Strangford Lough to 90 fathoms near the Maiden Rocks, attached to stones and shells. Different forms of this very variable species are recorded under the names *A. squamula, A. cylindrica,* and *A. aculeata.*

Anomia patelliformis, *Linné.*

General, living in 12-90 fathoms. Thompson has it under *A. undulata;* he mentions a fine specimen which was obtained adhering to the inside of a quart bottle found in the stomach of a cod-fish!

var. **striata.** Frequent, living in from 12 to 25 fathoms; Hyndman dredged dead shells in up to 100 fathoms (*A. striata.*)

Ostrea edulis, *Linné.*

Gregarious, and widely distributed, from low-water mark to 25 fathoms. Thompson mentions Carrickfergus oysters which he examined, which weighed, before being opened, over 2lbs., the animal by itself weighing 1½oz. Hyndman states, on the authority of a Groomsport fisherman, that oysters "of large size and good quality" have been brought up on the long lines from 45 fathoms; this depth is the limit assigned by Jeffreys to the species.

Pecten pusio, *Linné.*

Living in Belfast, Strangford, and Carlingford Loughs, and in the deeper waters of the Channel, in up to 90 fathoms, its other limit of depth being 10 fathoms. Thompson notes it *sub P. sinuosus.* Dead valves frequent on the Derry coast—R.Ll.P.

Pecten varius, *Linné.*

10-25 fathoms, attached to old bivalve shells, &c., like the last species. Of general occurrence around the coasts of Donegal, Derry, Antrim, and Down.

Pecten opercularis, *Linné.*

A common species, and almost universally distributed, living on sand in from 7 to 25 fathoms.

var. **lineata.** "Var. *lineatus* I have dredged in Belfast Bay"—Thompson. I have it also from this locality—R.Ll.P.

Pecten septemradiatus, *Müller.*

Recorded with doubt (*sub P. Danicus*) by Hyndman in his 1857 Report as from the Turbot Bank, determined by Dr. Dickie. In 1859 Report he records the finding of a second valve, in 80 fathoms, thus confirming Dr. Dickie's determination.

Pecten tigrinus, *Müller.*

Thompson mentions this shell, under the names *P. lævis* and *P. obseletus,* both of Pennant, as having been found in Belfast and Strangford Loughs. Hyndman dredged it frequently, living in 20-90 fathoms, and Dickie records it from Strangford Lough as living in 12-20 fathoms. Single valves at Portrush—Miss Richardson; and Magilligan—R.Ll.P.

Pecten Testæ, *Bivona.*

The following note on this rare species occurs in Hyndman's 1859 Report (*sub P. furtivus*):—"Taken alive in 1858 by Mr. Waller and Mr. Hyndman on both the Antrim and Down coasts, along with *P. striatus.* It was taken again this year, and at once distinguished by Mr. Jeffreys."

Pecten striatus, *Müller.*

"A single specimen dredged in Strangford Lough in 1837 by Mr. Hyndman and myself"—Thompson. Hyndman obtained it twice alive off Donaghadee, in 12 and 20 fathoms respectively, and also in 70-90 fathoms off the Maidens, and dead on the Turbot Bank. Dickie dredged dead valves in Strangford Lough.

Pecten similis, *Laskey.*

No note of its having been taken alive, but dead valves have been dredged frequently at the mouth of Belfast Lough, in 15-35 fathoms, and Dickie records the same from the entrance of Strangford Lough, 12-15 fathoms.

Pecten maximus, *Linné.*

Common here as elsewhere, living in 7-25 fathoms. "Along the Antrim and Down coasts, where it is commonly called *clam*, and used as human food, though not so generally esteemed as the scallop (*P. opercularis*)"—Thompson.

Lima subauriculata, *Montagu.*

Dead valves only, in from 4 to 90 fathoms on various parts of the Antrim and Down shores, by the Ordnance Survey collectors, Thompson, Hyndman, and Dickie.

Lima Loscombii, *G. B. Sowerby.*

"Dredged very sparingly, alive, in the deeper portions of Belfast and Strangford Loughs, on sandy and shelly ground. Single valves of large size obtained in quantity from 23 fathoms at the entrance to the former by Mr. Hyndman. Obtained occasionally in the stomach of haddock taken on the North-East coast"—Thompson, whose *L. fragilis* also belongs to this species. Hyndman procured it frequently, both living and dead, in 15-90 fathoms; Dickie took it alive outside Strangford Lough, in 12-15 fathoms.

Lima hians, *Gmelin.*

"The Ordnance Museum contains upon a card a fresh-looking specimen of this shell, as dredged from 7 fathoms in Belfast Bay"—Thompson (*sub L. tenera*). Hyndman's only note of it is a repetition of this record. From a note in Jeffreys' work, Waller would appear to have taken it somewhere on the North-East coast, and the Belfast Museum Collection contains a specimen of Thompson's labelled "Belfast Lough."

It is very doubtful if this species can be now reckoned among our indigenous mollusks; but it lived in abundance in our waters at no very distant date, for the Estuarine Clay at Magheramorne, on Larne Lough, yields it in the greatest profusion, and it has been found in the similar deposit at Belfast.

Pinna rudis, *Linné.*

This fine species, our largest British shell, inhabits the waters off Black Head (25-30 fathoms), where it has been obtained by Hyndman (*P. pectinata*) and others. Thompson mentions (*sub P. ingens*) a wider distribution; he says of it, "the very few specimens, all taken in deep water, which I have seen from the coasts of Londonderry, Antrim, Down, and Louth, were of large

size, and all *P. ingens* or *P. fragilis* (Turt. Brit. Biv.)," and he gives Portrush, Belfast Bay, and 50 fathoms off Island Magee, as localities where examples have been procured. It has been found at the first-mentioned station by Miss Richardson also. Probably the earliest record of this shell in our district is that in a letter from the Rev. Robert Innes, Rector of Magilligan, to Dr. Nicholson, Bishop of Derry, dated June 2nd, 1725, in which he describes a large example found in that neighbourhood. General Portlock, of the Geological Survey, writing in 1843*, and commenting on the above, says "this coast continues a good locality for *Pinna fragilis;* to obtain the fish in the valves they must be dredged up from deep water."

Mytilus edulis, *Linné.*

Common on all our shores. Thompson gives some interesting notes as to the rapid growth and increase of this prolific species; for instance, that on a buoy in Belfast Lough, cleaned after being 5 years down, "the entire circumference of the base, for a foot of space always under water, was covered a foot thick with full-grown mussels"; and that the bottom of the pilot-boat after its being 9 months afloat, yielded quantities of mussels 1½ inches long.

var. **incurvata.** "The only bivalve seen on Tory Island, where it is abundant, covering the rocks"—Thompson.

var. **pellucida.** "Common in some parts of Belfast Bay"—Thompson (*sub M. pellucidus*). Cultra, S. A. Stewart—Belf. Mus. Coll.

Mytilus modiolus, *Linné.*

The "horse-mussel" is common, living in gravelly and muddy localities in 6-90 fathoms. Dickie found it very abundant in Strangford Lough (4-25 fathoms), coming up in quantity in almost every haul of the dredge (*sub Modiola modiolus*).

var. **ovata.** "County Antrim (J.G.J.)"—Jeffreys.

Mytilus Adriaticus, *Lamarck.*

Rare in the province. Thompson mentions it (*sub Modiola tulipa*) from Belfast Lough; and Hyndman, under the same name, as living sparingly in 10 to 20 fathoms, while he obtained dead valves on the Turbot Bank, and in 75 fathoms near the Maidens. Strangford Lough—Belf. Mus. Coll. I have found complete and fresh-looking specimens on the shores of Belfast and Carlingford Loughs.

Mytilus phaseolinus, *Philippi.*

Living in 15-20 fathoms off Belfast Lough, and in 70-90 fathoms off Larne —Hyndman (*sub Modiola phaseolina*); and in 4-20 fathoms in Strangford Lough—Dickie.

Modiolaria marmorata, *Forbes.*

Found in numbers, embedded in the skin of *Ascidia mentula* and other *Tunicata*, all round the coast, in depths up to 90 fathoms. Hyndman places it under genus *Crenella*, and Thompson and Dickie under *Modiola*.

* Report on the Geology of the County of Londonderry &c., p. 23.

Modiolaria costulata, *Risso.*

Found at Bundoran, Co. Donegal, by Mr. Waller—Jeffreys.

Modiolaria discors, *Linné.*

"Larne Lough, not uncommon. Donaghadee, 8 to 10 fathoms, Dr. Drummond"—Thompson (*sub Modiola discrepans*). "Living, rare, at the roots of *Antennularia* and other Zoophytes, in from 10 to 25 fathoms"—Hyndman, who also obtained it, dead, on the Turbot Bank (*sub Crenella discors*). Crawfordsburn, Mr. S. A. Stewart—Belf. Mus. Coll.

Crenella rhombea, *Berkeley.*

"Bundoran (Waller)"—Jeffreys (Supplement).

Crenella decussata, *Montagu.*

Living in gravelly sand, in 15 to 30 fathoms, off Donaghadee, Black Head, and Larne, and it was one of the few species which Hyndman obtained alive in Larne Lough (4-5 fathoms). Thompson's only Irish note of the species states that Mr. Hyndman dredged a few odd valves in Strangford Lough; Dickie took it alive in 18-20 fathoms at the entrance of the latter.

Nucula nucleus, *Linné.*

Abundant, living in 5-90 fathoms, in sand and gravel, throughout the North of Ireland.

var. **radiata,** though stated by Thompson (*sub N. margaritacea*) to be common around the coast, has apparently a more limited distribution in our waters.

Nucula nitida, *G. B. Sowerby.*

Living in mud and sand in from 12 to 20 fathoms, off Donaghadee and Black Head—Hyndman; and frequent in 4-25 fathoms in Strangford Lough —Dickie. Hyndman also records it, with doubt, from 1-4 fathoms, Brown's Bay, Island Magee. Dead shells occur on the Turbot Bank.

Nucula tenuis, *Montagu.*

Hyndman records having dredged this species alive in deep water near the Maidens, and specimens labelled as from that locality are in the Belfast Museum.

Leda pygmæa, *Münster.*

"On the Antrim Coast"—Jeffreys (all said of it). Belfast Lough—Belf. Mus. Coll. It is rare as a British species, inhabiting chiefly the Scandinavian and arctic seas.

Leda minuta, *Müller.*

Portrush; 23 fathoms in Belfast Bay; and 50 fathoms off South Rock, Co. Down; all by Mr. Hyndman—Thompson (*sub Nucula minuta*). In his subsequent systematic exploration, Hyndman obtained it occasionally, living in mud, gravel, and sand, in from 12 to 90 fathoms, and more frequently dead, in 1-90 fathoms (*sub L. caudata*). Dickie took it alive in Strangford Lough.

Pentunculus glycymeris, *Linné.*

Living in sand and gravel in 10-90 fathoms all round our coast; and more

abundant in a dead state. Hyndman notes that it was dredged by his party in great quantity in 10 to 12 fathoms at Ballygalley, on the Antrim coast, all dead, but valves united and quite fresh, and that their death was due, in Dr. Dickie's opinion, to deposits from peat-bogs carried down by rivulets. Thrown up in abundance at Magilligan strand, but only single valves. Shells of unusual size ($2\frac{3}{4} \times 2\frac{3}{4}$ inches) may be found at Orlock Point, Co. Down; they have a rather ancient appearance, and are probably washed in from the Turbot Bank. Thompson cites this species *sub P. pilosus*.

Arca lactea, *Linné.*

Hyndman dredged dead specimens of this shell on the Turbot Bank (25-30 fathoms) on three occasions.

Arca tetragona, *Poli.*

"Portrush *in situ*—Ordnance Collectors. Magilligan, odd valves—W.T." —Thompson. Hyndman obtained it dead on the Turbot Bank several times, and records a single living specimen which he dredged in 50 fathoms, embedded in a pebble of black limestone, off the Copeland Islands. Single valves frequent on the Derry coast—R.Ll.P.

[**Arca barbata,** *Linné.*

" 'This very perfect and new shell on our coasts was found alive, adhering to an oyster from Killinchy in Strangford Lough, by Dr. M'Gee of Belfast,' Brown. Never found since"—Thompson. It is a common Mediterranean species, which is not admitted as native by any of our conchologists. There must have been some mistake.]

Lepton nitidum, *Turton.*

Dredged alive by Waller on the Turbot Bank, and dead in the same vicinity by Waller and Hyndman—Hyndman, 1858 Report.

Montacuta substriata, *Montagu.*

This little shell, whose peculiar habitat is the ventral spines of *Spatangus purpureus* and other Echinoids, is noted by Thompson and Hyndman as living at the entrance of Belfast Lough, in 20 to 30 fathoms, and by Dickie off Strangford Lough, in 12 to 15 fathoms.

Montacuta bidentata, *Montagu.*

"Bangor, Belfast Bay (one specimen), 1834, Mr. Hyndman and W.T. Bundoran, Mr. Warren"—Thompson. Hyndman, and Mr. Wm. Swanston dredged it dead on the Turbot Bank. Cushendall—Belf. Mus. Coll. These appear to be the only records of a species whose decline as a member of the marine fauna must have been rapid, as our pleistocene clays yield it in great profusion.

Montacuta ferruginosa, *Montagu.*

Turbot Bank, dead—Hyndman. The *M. ovata* mentioned by Thompson is probably this species; he states that several examples of it were found on the beach at Bundoran by Mrs. Hancock.

Lasæa rubra, *Montagu.*

Common between tide marks—Hyndman. Portrush, and Belfast Bay—Thompson. (Both *sub Kellia rubra*). Magilligan—Belf. Mus. Coll.

Kellia suborbicularis, *Montagu.*

Bundoran—Thompson. Dead, rare, in 10 fathoms in Belfast Bay, and on the Turbot Bank—Hyndman. In Strangford Lough, and in the Irish Channel adjoining, Dickie found it living in 7 to 25 fathoms. Magilligan—Belf. Mus. Coll.

Loripes lacteus, *Linné.*

Recorded from the Turbot Bank, dead, by Hyndman, 1857 Report (*sub Lucina leucoma*). This record is not confirmed by Jeffreys, and as the species was not obtained again, and is entirely a southern form, it is doubtful if it should be included in our fauna.

Lucina spinifera, *Montagu.*

"At Red Bay, County Antrim, I found a valve of this species"—Thompson. Hyndman dredged it once alive "on a bank called 'The Riggs,' lying south of the Copelands, about a mile south of Donaghadee, and a mile from shore, in about 20 fathoms," and several times dead, off Belfast Lough, in 15-30 fathoms.

Lucina borealis, *Linné.*

Commonly dredged in a dead state, in Belfast and Larne Loughs and the deeper waters adjacent, in all depths from 1 to 30 fathoms. Thompson mentions it (*sub L. radula*) as found at Red Bay, and in 6 to 12 fathoms in Belfast and Strangford Loughs, by himself and Mr. Hyndman, but as the latter naturalist, in his subsequent report on the *Mollusca* of Belfast Bay (1857), notes it only in the column of dead shells, it may be assumed that such alone were found in the locality named. In Strangford Lough Dickie took it frequently alive, in depths ranging from 7 to 25 fathoms. Single valves are commonly thrown ashore on the Derry coast, where also the writer has found living specimens.

Axinus flexuosus, *Montagu.*

"Widely distributed, but in sparing numbers"—Thompson. I find no note of its having been taken alive. Hyndman dredged dead specimens occasionally in 5-30 fathoms, and Dickie, in Strangford Lough, 4-25 fathoms. Thompson gives Strangford Lough and Bundoran as localities. (Mentioned by the authors quoted *sub Lucina flexuosa*).

Cyamium minutum, *Fabricius.*

Abundant, among sea-weeds and stones near low-water mark. Thompson states (*sub Montacuta purpurea*) that the shoals of mullet (*Mugil chelo*) consume vast quantities of them when roving over the *Zostera* banks in spring and summer, and Hyndman (*sub Turtonia minuta*) estimates that in the stomach of a mullet taken in Larne Lough, there were 35,000 of these little shells.

Cardium echinatum, *Linné.*

In the reports of Hyndman and Dickie, the only note of this fine shell having been taken alive is by the former, who obtained a few living examples in Larne Lough, 4 to 5 fathoms; while in a dead state it occurred in all the localities dredged, in 4 to 30 fathoms. Thompson says "dredged from oozy sand in Belfast and Strangford Loughs" by Hyndman and himself, but does not state whether living or dead. Dredged alive in 6 fathoms off Bangor—Mr. S. A. Stewart. After northerly gales it is thrown ashore in some numbers on the Co. Down shore of the lough, from Holywood to Craigavad, with the animal quite fresh. Single valves of large size are abundant, and complete specimens frequent, on the sandy beaches of Magilligan and Portrush.

Cardium exiguum, *Gmelin.*

Living in oozy ground in Larne Lough, and in the deeper waters adjoining, in 4 to 90 fathoms; the limit assigned by Jeffreys is 15 fathoms, so the greater depth quoted would appear to be quite unusual. In and around Belfast Lough it has not been taken alive, and is rare in a dead state. It lives sparingly in Strangford Lough—Dickie, and R.Ll.P. Thompson gives Red Bay as an additional station. (*Sub C. pygmœum* by Hyndman and Dickie). Portrush, dead—Miss Richardson.

Cardium fasciatum, *Montagu.*

Frequent, living on gravel and sand in 15 to 20 fathoms. Dead in Strangford Lough, on the Turbot Bank, and in up to 90 fathoms of water off Larne. In Thompson's work it appears as *sub C. elongatum* and *C. edule* var. *fasciatum.*

Cardium nodosum, *Turton.*

Belfast and Strangford Loughs—Thompson. Dredged living in 12 fathoms in the Sound between the Copeland Islands, and dead on the Turbot Bank, by Hyndman. More abundant in Strangford Lough and the channel adjoining than elsewhere; Dickie dredged it frequently there, living in 7-20 fathoms.

Cardium edule, *Linné.*

Gregarious everywhere in sandy bays, at and near low-water mark. Dead shells are dredged on the Turbot Bank, and Hyndman obtained a living example in 20 fathoms between the Maidens and the Isle of Muck. "Attains a very large size in Donegal Bay"—Thompson.

Cardium minimum, *Philippi.*

Thompson made a new species, *C. Loveni*, out of specimens of this shell dredged by Mr. Hyndman from 50 fathoms off the South Rock, Co. Down, and although they subsequently proved to be identical with a species already described and named, to him belongs the credit of having added this pretty shell to the British fauna. Hyndman subsequently records it (*sub C. Suecicum*) from the Turbot Bank, and from shallower water (4-5 fathoms) in Larne Lough—in both instances dead.

Cardium Norvegicum, *Spengler.*

"Dredged off Glenarm, in Belfast and Strangford Loughs, sparingly"—

Thompson (*sub C. lævigatum*); it is not stated that any of the specimens obtained were alive. Hyndman took it alive only once, which was in 15 fathoms, on a bottom of mud and shells, 4 miles S.S.E. of Black Head, and Mr. Swanston has dredged living examples, of small size, at the entrance of the lough. Dead, it is abundant at various depths in many localities; large single valves are frequently thrown up on the Co. Down shore of Belfast Lough.

Isocardia cor, *Linné.*

This large and handsome shell is extremely rare in the North of Ireland, and the authority for its admission to our marine fauna rests almost entirely with Thompson, whose notes of its occurrence I may give in full:—"The following note appears in Mr. Templeton's MS. journal, under October 28th, 1811: 'Received a drawing of the *Chama cor*, from Mr. George Joy, taken by him from a specimen dredged up at Bangor (Belfast Bay).' The species is known to Mr. J. R. Clealand to have been dredged near the Copeland Islands, at the entrance of this bay. The Giant's Causeway is named by Turton as a locality in which it has been found; but very rarely. Glassdrummond, Co. Down, P. Doran." The only other record of its occurrence which I have come across is in Dr. Dickie's report, who notes it "very rare, dead," upper part of Wellstream Bay, Strangford Lough, 4-8 fathoms. Jeffreys gives east and south of Ireland alone.

Cyprina Islandica, *Linné.*

Living throughout our waters, in sand and mud, in 1-25 fathoms. Thrown up in great numbers on Magilligan strand during northerly gales. From Thompson's notes it would appear to be much more abundant on the eastern than on the western shores of Ireland. Mr. W. H. Patterson, M.R.I.A., contributes two curious local names for this species: the one is "yaghan" or "neayghen," the other "griggan."

Astarte sulcata, *Da Costa.*

"Dredged off the Co. Antrim coast; in Belfast and Strangford Loughs sparingly, from about 8 to 25 fathoms, on mud and sand"—Thompson (*sub A. Danmoniensis*). Living in from 10 to 27 fathoms, at the entrance to Belfast Lough, and more abundantly off Larne, in 15-90 fathoms—Hyndman; and in 7-25 fathoms in Strangford Lough—Dickie.

var. **Scotica.** Antrim coast; Belfast and Strangford Loughs—Thompson (*sub A. Scotica*). Living in 10-20 fathoms off Belfast Lough, and in 70-90 fathoms near the Maidens, and dead on the Turbot Bank—Hyndman. I have specimens dredged near Ardmillan, in Strangford Lough.

var. **elliptica.** Belfast Lough—Belf. Mus. Coll.

Astarte compressa, *Montagu.*

Hyndman's 1859 Report contains a note of a few valves of this species having been found in Turbot Bank sand by Mr. Jeffreys; but Jeffreys, in his "British Conchology," says, evidently referring to the same specimens,

"subfossil in 25 fathoms off Larne, Co. Antrim." As will appear subsequently, this is by no means the only northern species which has been dredged, if not fossil, at least very doubtfully recent, in that locality.

Astarte triangularis, *Montagu.*

Belfast and Strangford Loughs, dredged by Mr. Hyndman—Thompson (*sub Goodalia triangularis*). Living on the Turbot Bank—Hyndman; and in Strangford Lough and the channel adjacent—Dickie; depth 7 to 30 fathoms, sandy ground. Dead valves are abundant on the Turbot Bank.

Circe minima, *Montagu.*

Thompson's only northern locality is Belfast Bay, on the authority of Mr. Hyndman (*Cyprina minima*). Hyndman obtained it alive twice, in 20 fathoms, gravelly bottom, his stations being the Cod Bank north of the Isle of Muck, and "The Riggs" bank south of the Copeland Islands, while in a dead state it occurred frequently in depths ranging from 15 to 100 fathoms. Dickie procured living examples off the mouth of Strangford Lough, 12-15 fathoms, and dead valves further out to sea.

Venus exoleta, *Linné.*

Belfast, Strangford, and Larne Loughs—Thompson, who does not state if the shell was alive in any instance. Though noted by Hyndman and Dickie from almost every station (1-30 fathoms), in no case was it taken in a live state. Hyndman remarks (1857 Report) that at Cultra single valves are thrown up by the tide, and says, "probably still living." At the place in question, fresh-looking specimens with the valves attached are frequent, and I have twice picked up living examples there, and have no doubt that it lives in some quantity in the vicinity. This and the following species are placed under the genus *Artemis* by the authors quoted.

Venus lincta, *Pulteney.*

Rare in a live state, the Cod Bank north of Isle of Muck (20 fathoms), Wellstream Bay in Strangford Lough (15 fathoms), and 12-15 fathoms in the open channel near the entrance of the latter, being the only stations I can find. More common dead, thrown up on sandy beaches, from Magilligan in Co. Derry to Newcastle in Co. Down.

Venus fasciata, *Da Costa.*

This beautiful species is of frequent occurrence throughout the district, living on gravelly and sandy ground; it has been dredged alive off Larne and Belfast Lough, and in Strangford Lough and the open sea adjoining, in depths varying from 7 to 30 fathoms, by Thompson, Hyndman, Dickie, and others.

Venus Casina, *Linné.*

Another handsome species, which inhabits our waters, ranging from 7 fathoms in Strangford Lough to 70 fathoms off the Maiden Light-houses, on gravel, sand, and mud. Dead valves are plentiful on the Turbot Bank and at various depths (6 to 90 fathoms), on the Antrim coast.

[**Venus verrucosa,** *Linné.*

"Mr. Hyndman's cabinet contains a young shell (*V. cancellata*) given him as from Magilligan"—Thompson; much too slender evidence on which to establish a claim for its admission to our fauna. Its distribution in Ireland is confined to the south and west.]

Venus ovata, *Pennant.*

The dredgings of Hyndman and Dickie show that this pretty little shell is one of the most generally distributed of all our bivalve mollusks, as it occurred in almost every haul, generally alive, in from 4 to 90 fathoms. In Strangford Lough it lives in great abundance, and it is one of the very few species which Hyndman found living in Larne Lough. "A rather common species"—Thompson (*Cytherea ovata*).

Venus gallina, *Linné.*

A common species. "Found alive from low-water mark to 8 and 10 fathoms on the North and North-East sandy coasts. Thrown ashore on the sandy beach of Magilligan in quantity and of large size"—Thompson. The *V. Pennantii* mentioned by this author belongs to the present species. Hyndman and Dickie found that it lives in from 0 to 25 fathoms in all the waters explored (*sub V. striatula*). The *V. striolata* in Dickie's paper is apparently a misprint for *V. striatula.*

Tapes aureus, *Gmelin.*

Quoting from an older authority, Thompson says of this species "'Carrickfergus Bay (Dr. M'Donnell) rare,' Brown," and under Turton's name of *Venus œnea*, gives Strangford Lough as a locality where he has taken it alive. Hyndman states (1857 Report) that it is common, living on sandy beaches between tide-marks, but it does not appear to be by any means of such frequent occurrence as would appear from this remark. Dickie dredged dead valves in Strangford Lough, and Hyndman on the Turbot Bank. Mr. Swanston informs me that it is abundant in Lough Swilly, in Co. Donegal, and Miss Richardson has sent me complete and fresh specimens from Portrush.

Tapes virgineus, *Linné.*

This handsome shell is of very common occurrence, in sandy and nullipore ground, in 4 to 90 fathoms all round our shores.

var. **Sarniensis.** "Var. *V. Sarniensis*, Turt. Brit. Biv., is taken in Belfast Bay"—Thompson (*sub Pullastra virginea*). "Donaghadee, in 8 fathoms (Patterson)"—Forbes and Hanley. "Living, rare, off Bangor"—Hyndman.

var. **elongata.** "Larne, Co. Antrim (Hyndman)"—Jeffreys. Belfast Lough —Belf. Mus. Coll.

Tapes pullastra, *Montagu.*

Abundant, living between tide-marks. "A common species on sandy beaches"—Thompson (*sub Pullastra vulgaris*). Dickie records it living in the unusual depth of 7-20 fathoms in Castle Ward Bay, Strangford Lough. Some valves from Belfast Lough are of unusual size—2½ inches broad.

Jeffreys says the breadth of his largest specimen, found in Skye by Edward Forbes, is $2\frac{1}{4}$ inches, and that 1·7 is the average breadth.

var. **perforans.** Inhabits the forsaken burrows of *Pholades*, and chinks of rocks. Common—Thompson (*sub Pullastra perforans*).

var. **oblonga.** "Bundoran, Co. Donegal (J.G.J.)"—Jeffreys.

Tapes decussatus, *Linné.*

There is no certain record of this generally common species having been taken alive in our province. Thompson, referring to the whole of Ireland, says (*sub Pullastra decussata*) "a common species", and in his "Report on the Fauna of Ireland" (1843), he has a cross opposite its name in the "North of Ireland" column, but he mentions no northerly locality. Jeffreys simply says "shores of Ireland". Hyndman's only note is to the effect that it occurs in the alluvial deposits, and is not now known to be living in Belfast Lough; neither he nor Dickie found even dead valves in their dredgings. Miss Richardson has found a specimen with the valves united, at Portrush, but the shell looks old and worn. I have taken it alive at Carlingford, and it is abundant on the coast of Co. Louth, but appears to stop short on the borders of Ulster.

Lucinopsis undata, *Pennant.*

Dead valves occasionally dredged by Hyndman in 5-90 fathoms in Belfast Lough, and off Larne; and Mr. Swanston has taken it off White Head with the valves still united. Thompson gives "Belfast Bay" (*sub Artemis undata*). Miss Richardson has sent me a fresh and complete specimen from Portrush sands, evidently but recently dead. Like the preceding species, this would appear to be one of those shells which are dying out in the district, as, like it, while it is very rare in a live state, it is to be found in profusion and of large size in the post-tertiary clays in our estuaries.

Tellina crassa, *Pennant.*

Hyndman dredged a single living specimen on the Cod Bank, 3 miles north of Isle of Muck, 20 fathoms, gravelly bottom. In a dead state it has occurred in various localities, Strangford Lough included, in 10-30 fathoms—Thompson, Hyndman, and Dickie. Single valves are thrown up by the tide at Orlock Point, Co. Down, in some quantity—R.Ll.P.

Tellina Balthica, *Linné.*

Common between tide-marks on every shore. *Sub T. solidula* by the writers quoted above.

Tellina tenuis, *Da Costa.*

A common gregarious species, living in sand about low water mark. "The plaice in Belfast Bay feed very much on *T. tenuis*"—Thompson. Dead valves of both this species and the preceding dredged on the Turbot Bank, 25-30 fathoms, by Hyndman.

Tellina fabula, *Gronovius.*

"Not uncommon on extensive sandy beaches, as Magilligan, W.T. Found

from below low water mark to a few fathoms, on sand"—Thompson. Dickie dredged it living outside Strangford Lough, in 7-15 fathoms: Hyndman records dead specimens only.

Tellina squalida, *Pulteney.*

Not a common species anywhere; rare in our province, and in a dead state only. "Red Bay, Co. Antrim, Mrs. J. Thomson Tennant"—Thompson; specimens from this locality are in the Belfast Museum. Dredged by Hyndman on the Turbot Bank; in shallow water in Brown's Bay, Island Magee; and in 20 fathoms off Black Head (*sub T. incarnata*).

Tellina donacina, *Linné.*

Strangford Lough—Thompson; whether living or dead not specified. Dead in Strangford Lough—Dickie; and on the Turbot Bank—Hyndman. The latter obtained a single live specimen in 20 fathoms, gravel bottom, on the Cod Bank, north of Isle of Muck.

Tellina pusilla, *Philippi.*

"Dead, valves united, from the Turbot Bank sand"—Hyndman, 1859 Report (*sub T. pygmæa*).

Psammobia tellinella, *Lamarck.*

Living in Belfast and Strangford Loughs, and the waters adjoining, in depths ranging from 7 to 30 fathoms—Thompson, Hyndman, and Dickie. Dead valves were dredged in Larne Lough and other places.

Psammobia costulata, *Turton.*

A single valve, found by Jeffreys in Turbot Bank sand which was forwarded to him by Hyndman, is the only trace of this species in our province.

Psammobia Ferröensis, *Chemnitz.*

"Commonly thrown ashore on most sandy beaches. Inhabits below low-water mark"—Thompson. Hyndman and Dickie never seem to have taken it alive, but in a dead state it occurred in most of their dredgings. Thrown up alive by the tide at Castlerock, Co. Derry, and Cultra, Co. Down—R.Ll.P.

Psammobia vespertina, *Chemnitz.*

"From Larne Lough, Co. Antrim, a specimen has been sent me"—Thompson. This appears to be the only published note of its occurrence in the North of Ireland. I have before me over a dozen single valves, some of them quite fresh, which were picked up in about twenty minutes' search on the beach at Cultra, Co. Down; it evidently lives in some quantity at no great distance from that place.

Donax vittatus, *Da Costa.*

"Generally common on extensive sandy beaches. Plentiful close to low water mark at Magilligan, where it is collected by the people for food. Dredged plentifully, but of small size, on pure sand, at a few fathoms' depth, off Newcastle, Co. Down, Mr. Hyndman and W.T."—Thompson (*sub D. trunculus*). The dredgings of Hyndman and Dickie, being generally in

deeper water, do not fairly show its distribution: indeed, this common species was only obtained once—in Brown's Bay, Island Magee (*D. anatinus*). Portrush, Ballycastle, and a single valve at Ballyholme Bay—R.Ll.P.

[**Donax denticulatus,** *Linné.*

"A specimen said to be from Magilligan is in Mr. Hyndman's collection" —Thompson. This is a West Indian species, erroneously introduced into British lists.]

Mactra solida, *Linné.*

"Not generally distributed; Magilligan, Red Bay, and Larne"—Thompson. "A single valve dredged up off Castle Chichester, and odd valves off Bangor"—Hyndman. Dredged between Bangor and Donaghadee, 6-8 fathoms—Mr. S. A. Stewart (whether living or dead not stated). Portrush, dead, Miss Richardson. Dead valves are abundant at Magilligan, and are not uncommon on the shore beyond Groomsport, Co. Down—R.Ll.P.

var. **truncata.** "Found near low water mark in sand; brought to Belfast with cockles for sale, and together with *Venus aurea*, similarly obtained, commonly called 'Lady Cockle'; Red Bay, W.T."—Thompson. "Bangor Bay, Down (Patterson)"—Forbes and Hanley. "Living on sandy shores between tide marks"—Hyndman. Groomsport—Belf. Mus. Coll.

var. **elliptica.** "Belfast and Strangford Loughs; specimens dead in both localities"—Thompson. Dredged frequently by Hyndman, living, in 12 to 30 fathoms; dead shells common on the Turbot Bank. Dickie took it alive in Strangford Lough and the channel outside. (All *sub M. elliptica*).

Mactra subtruncata, *Da Costa.*

"Dredged from 10 to 12 fathoms, on sand, in Strangford Lough, Mr. Hyndman and W.T."—Thompson. "Living, few," in Brown's Bay, Island Magee, 4 fathoms and less—Hyndman. Groomsport—Belf. Mus. Coll.

var. **inæquivalvis.** "Lough Strangford (Adair)"—Jeffreys; which is the only station assigned by that eminent conchologist to this variety.

Mactra stultorum, *Linné.*

Living on sandy beaches near low water mark; rather local. Red Bay, Co. Antrim, and Newcastle, Co. Down—Thompson. Being a littoral species, it did not occur in any of Hyndman's or Dickie's dredgings. Portrush, and abundant on the Derry coast, and frequently washed up alive on the Co. Down shore from Holywood to Donaghadee—R.Ll.P.

var. **cinerea.** Magilligan—Thompson.

Under the various species and varieties of the above rather critical genus, I have simply placed the notes on them by the observers named, without comment, but there seems to have been some confusion regarding *M. solida* var. *truncata* and *M. subtruncata*, at least. Contrary to what the notes above might lead one to expect, it is the latter that is by far the more abundant of the two in our district, living in profusion in Belfast Lough and elsewhere, and it is to

it that I have always heard the name "Lady Cockle" applied. Beyond the records given, I do not know of *M. solida* var. *truncata* having been taken in the neighbourhood.

Lutraria elliptica, *Lamarck.*

Burrowing deeply in sand and mud, at and below low water mark; common. "Like *Mya arenaria*, plentiful in localities on all sides of the coast" —Thompson (*sub L. vulgaris*). Dredged occasionally (dead) by Hyndman, and alive in 12-15 fathoms by Dickie off Strangford Lough. Newcastle, Ballyholme, Cultra, Redbay, Ballycastle and Portrush may be mentioned as localities, and on the Derry coast it is very abundant. Rev. Canon Grainger, D.D., informs me that the young shells of this species are called "aprons" on Magilligan strand.

Lutraria oblonga, *Chemnitz.*

"Magilligan, Mr. Hyndman"—Thompson (*sub L. hians*).

Scrobicularia prismatica, *Montagu.*

Magilligan, Belfast Bay, and from 50 fathoms off the South Rock, Co. Down —Thompson (*sub Amphidesma prismatica*). "Living, rare, in 20 fathoms off Black Head", and frequent in a dead state, 1-27 fathoms—Hyndman; living both in and outside of Strangford Lough, in 7-20 fathoms—Dickie (*sub Syndosmya prismatica*).

Scrobicularia nitida, *Müller.*

Near Portaferry in Strangford Lough—Thompson (*sub Amphidesma intermedia*). Living, rare, in deep water off Belfast Lough, and in 4-5 fathoms in Larne Lough—Hyndman (*sub Syndosmya intermedia*). Dickie dredged it alive in 15 fathoms in Strangford Lough, and also, in abundance, in 25-26 fathoms in the open channel, 6-7 miles from the bar, on a bottom of fine mud.

Scrobicularia alba, *Wood.*

Belfast and Strangford Loughs, sparingly, oozy sand, 8-10 fathoms—Thompson (*sub Amphidesma Boysii*). Living in Belfast Lough, in 8 to 12 fathoms—Hyndman; and in Strangford Lough, in 6 to 20 fathoms—Dickie (*sub Syndosmya alba*). In a dead state it has been dredged at all depths. Living, common, in 6-8 fathoms off Bangor—Mr. S. A. Stewart.

var. **curta.** "Lough Strangford (Waller); Larne, Co. Antrim (J.G.J.)"—Jeffreys.

Scrobicularia tenuis, *Montagu.*

"I have received specimens of this well-marked species from Larne Lough, County of Antrim"—Thompson. Thompson's specimens from this locality are in the Belfast Museum. It does not appear to have been found since.

Scrobicularia piperata, *Bellonius.*

"This should not perhaps have been noted in the Belfast Bay column, as though not uncommon in a dead state, it has not been found alive to my knowledge"—Thompson (*sub Lutraria compressa*). "Has not been found living,

but is probably to be found"—Hyndman. Like *Tapes decussatus*, this species appears to stop short on the borders of our province, as it lives in Carlingford Lough (R.Ll.P.), and abounds further southward, while it has never been taken alive further north. Like *T. decussatus*, too, it occurs in profusion in our Estuarine Clays, whence are probably derived the odd valves which are found in Belfast Lough and elsewhere.

Solecurtus candidus, *Renier.*

Dead; dredged by Hyndman on the Turbot Bank, and by Dickie in 12-15 fathoms outside Strangford Lough. Very rare.

Solecurtus antiquatus, *Pulteney.*

"Red Bay and Larne Lough, Co. Antrim—Strangford Lough, 8-10 fathoms, soft sand, W.T."—Thompson (*sub Solen antiquatus*). Hyndman dredged it several times, in a dead state, off Black Head, in 15 to 30 fathoms. In Strangford Lough, Dickie obtained it in almost every haul of the dredge, but never alive. (By Hyndman and Dickie *sub S. coarctatus*).

Ceratisolen legumen, *Linné.*

The following from Thompson (*sub Solen legumen*):—"'Plentiful on the East coast from Cork to Belfast', Brown's Illust. p. 113, 2nd edit. This remark gives quite too extensive an idea of its distribution. Specimens from the extensive sandy coasts of Dublin and Louth only have come under my notice; if the species be found so far North as Down, it must be only on the more southern part of it". Newcastle, Co. Down—Belf. Mus. Coll.; and Mr. Swanston has a fresh and complete specimen, and also a fresh single valve, which he found thrown up by the tide at this place.

Solen pellucidus, *Pennant.*

A rather common species, living in all our bays and in the deeper waters, on sand and mud, in depths varying from 3 to 25 fathoms. Thompson mentions that plaice caught on the northeast coast have sometimes their stomachs filled with remains of this shell.

Solen ensis, *Linné.*

Common in sandy bays throughout the province.

Solen siliqua, *Linné.*

"Most common of the genus on our coast generally"—Thompson. Dead valves have been dredged in up to 90 fathoms, but the habitat of the species is in sandy bays between tide-marks, where it is abundant. As noted by Hyndman, very fine specimens are to be found at Ballyholme Bay, Co. Down.

Solen vagina, *Linné.*

"A specimen has been given me as from Larne Lough"—Thompson. "On the Irish coast it is local, inhabiting very extensive sandy beaches, as those of Magilligan, and of the counties of Dublin and Cork (Thompson). In eight fathoms, Bangor, County Down, dead (Patterson)"—Forbes and Hanley. "Dead, off Bangor, Co. Down" is Hyndman's only note of it (*sub S. marginatus*), and Dickie's dredgings never yielded it. This species, which is so rare

in our present waters, occurs throughout our later post-tertiary deposits, while *S. siliqua*, which is not found in these beds, appears to have now taken its place, being abundant in suitable localities.

Pandora inæquivalvis, *Linné.*

var. **obtusa.** "Dredged off Carrickfergus, Mr. Hyndman; subsequently by Mr. Hyndman and myself in Strangford Lough"—Thompson. Taken alive off Black Head and Donaghadee, in 15 to 20 fathoms, by Hyndman; and off the entrance of Strangford Lough, in 18-20 fathoms, by Dickie. (All *sub P. obtusa*). Dead on the Turbot Bank and elsewhere.

Lyonsia Norvegica, *Chemnitz.*

This curious shell is rare in the district. "Dredged in Belfast and Strangford Loughs, in from 6 to 12 fathoms, among seaweed"—Thompson. Living in from 8 to 12 fathoms in Belfast Lough, and dead on the Turbot Bank—Hyndman. Dickie took it alive in 15 to 25 fathoms in Strangford Lough, and dead in shallower water. Off Crawfordsburn, 6 to 7 fathoms, dead, but fresh and valves united—Mr. S. A. Stewart.

Thracia prætenuis, *Pulteney.*

Thompson says of it (*sub Anatina prætenuis*)—"'Belfast Lough, rare,' Brown. The latter locality probably a mistake. Magilligan is the only northern locality in which the species has yet been met with by Mr. Hyndman or myself; it is thrown ashore quite fresh there". Dredged by Hyndman in 15, 20 (valves united), and 27 fathoms off Belfast Lough, and in 20 fathoms off Larne, dead in each instance. "Coast of Down (Patterson)"—Forbes and Hanley. (All *sub Cochlodesma prætenue*). I have a valve found by my brother at Magilligan.

Thracia papyracea, *Poli.*

"Belfast and Strangford"—Thompson (*sub T. declivis*, Thor.). Dredged by Hyndman at various points around the entrance to Belfast Lough, in 20 to 30 fathoms, and by Dickie both in and outside of Strangford Lough, in 7-20 fathoms; in all instances dead (*sub T. phaseolina*). Dead, in 6-8 fathoms, off Bangor and Donaghadee—Mr. S. A. Stewart.

var. **villosiuscula.** Dead, in from 1 to 30 fathoms, off Belfast Lough and Island Magee—Hyndman (*sub T. villosiuscula*).

Thracia pubescens, *Pulteney.*

"Belfast Bay"—Thompson. On the Turbot Bank, rare, dead—Hyndman. "The reputed Irish localities are doubtful"—Jeffreys.

Thracia convexa, *W. Wood.*

"Difficult to procure on account of its habit of burrowing rather deeply in muddy sand"—Jeffreys, which may perhaps account for its not having been taken alive in the province. "In Strangford Lough"—Thompson; specimens from thence are in Thompson's collection in the Belfast Museum. "Not known to be now living in the Bay; two specimens have been dredged off

Black Head, broken, but with ligament fresh, so that it is probably still living" —Hyndman. Dickie took it three times in Strangford Lough, but dead in each case.

Thracia distorta, *Montagu.*

"In limestone near Belfast, with *Saxicava*, Mr. Grainger"—Thompson. The only other note is a repetition by Hyndman of this record.

Corbula gibba, *Olivi.*

"Strangford Lough is the best locality known to me for this species, in some parts of which it is common on muddy ground, at a depth of about from 4 to 10 fathoms"—Thompson (*sub C. striata*). Living in 12-20 fathoms off Belfast Lough, and in 1-90 fathoms off Larne and the Maidens—Hyndman. The results of Dickie's explorations in Strangford Lough amply confirm Thompson's note, as this shell was found in abundance, alive, at every station, 4 to 25 fathoms. Living, common, 8-10 fathoms, Belfast Bay—Mr. S. A. Stewart.

Mya arenaria, *Linné.*

A common littoral species, living in abundance in muddy estuaries. I have seen specimens of unusual size (3 x 5 inches) dug on the Holywood Bank for bait, and at Cultra have found small distorted individuals inhabiting the forsaken burrows of *Pholades*. Locally called "cockabrillion" or "cockle-brillion."

Mya truncata, *Linné.*

With the last, but frequenting more the open sea.

var. **abbreviata** was dredged by Hyndman and Jeffreys living in 80 fathoms off the Antrim coast, some 10 miles from land.

Mya Binghami, *Turton.*

Turbot Bank, living, rare—Hyndman (*sub Sphœnia Binghami*). Occasionally met with in a dead state.

Saxicava rugosa, *Linné.*

Burrowing in limestone and old shells, or free. "Common around the coast on the North and East"—Thompson. Living commonly in from 0 to 30 fathoms in the waters explored by Dickie and Hyndman; the latter dredged living examples in 70-90 fathoms near the Maiden Rocks.

var. **arctica.** With the typical form, but not so abundant, and inhabiting rather deeper water (*S. arctica*).

Venerupis Irus, *Linné.*

In Thompson's collection in the Belfast Museum, there are specimens of this shell labelled "Bundoran, Co. Donegal"; in the 4th volume of the "Natural History of Ireland" there is no mention of its occurrence there.

Pholas dactylus, *Linné.*

Burrowing in sandstone, marl, and hard clay, between high and low water mark, on both sides of Belfast Lough; Carrickfergus, Greenisland, and Cultra may be mentioned as localities where it may be taken alive.

Pholas candida, *Linné.*

The most common of the genus in Belfast Lough, inhabiting the same situations as the last. Dickie dredged dead valves in 7-20 fathoms in Castle Ward Bay, Strangford Lough.

Pholas parva, *Pennant.*

"Was procured some years ago off the Long Strand, Belfast Bay, by Dr. J. L. Drummond; subsequently by the Ordnance collectors at Whitehouse Point, in the same bay"—Thompson. Hyndman supplies the additional information that it was in submerged peat that it occurred in the former locality.

Pholas crispata, *Linné.*

"Belfast Lough, Brown. Inhabiting indurated clay about low water mark, Belfast Bay"—Thompson. "Living in submerged peat at extreme low-water in Bangor Harbour, County Down, and in other places—Hyndman. Castle Chichester, in Triassic marl, but of very small size—Mr. Swanston. It flourishes on the shore at Cultra, near low water mark, in Boulder Clay, New Red Sandstone, and Carboniferous Shale; at this place, from a piece of soft sandstone less than 6 inches square, the writer has taken *P. dactylus*, *P. candida*, *P. crispata*, and *Tapes pullastra* var. *perforans*, all living.

Pholadidea papyracea, *Turton.*

"Two specimens in the Ordnance Museum are labelled "Portrush", North of Ireland"—Thompson (*sub Pholas papyracea*). "Discovered in the dredgings of 1857, embedded in rolled lumps of hard clay, and again in the deep water this season" (1858)—Hyndman. Off the Maiden Rocks, 70-90 fathoms, is the station where these specimens, which were living, were obtained. In his 1859 Report, Hyndman again records it "living at the depth of 80 fathoms north of the Maidens, in small pieces of soft sandstone. The smaller specimens want the cup-shaped appendage, whether the effect of insufficient space or immature growth." Hyndman first recorded it as *Pholas striata*, but subsequently corrected it to the present species. "Sandstone at low-water, Castle Chichester near Belfast (Hyndman)"—Jeffreys; whence it has been obtained subsequently. Low water mark being its usual habitat, it is probable that all the deep water specimens above should go under the following variety, which is essentially a deep water form.

var. **aborta.** "In soft sandstone dredged in 80 f. off the coast of Antrim (J.G.J.)"—Jeffreys.

[**Teredo Norvegica,** *Spengler.*

"Donaghadee (Co. Down), the animal alive"—Thompson. "Not known as living in the Bay"—Hyndman. Probably stray specimens only have been met with here.]

CLASS SOLENOCONCHIA.

Dentalium entalis, *Linné.*

"On most parts of the Irish coast"—Thompson. The curious "tooth-shell" lives in some profusion on the Antrim and Down coasts, on sand and mud, in depths varying from 5 fathoms in Belfast Lough to 90 fathoms at the Maiden Rocks.

CLASS GASTEROPODA.

ORDER CYCLOBRANCHIATA.

Chiton fascicularis, *Linné.*

"Generally distributed"—Thompson. Living in Strangford Lough—Dickie, and Mr. S. A. Stewart.

var. **gracilis.** "Lough Strangford (Adair). A specimen from the last-mentioned locality measures nearly an inch and a half in length, while the largest that I have of the typical form (from Unst), is scarcely an inch long" —Jeffreys.

Chiton Hanleyi, *Bean.*

"A fine living specimen on a shell, and one on a stone, in 80 fathoms"—Hyndman, 1859 Report.

Chiton cancellatus (*Leach?*), *G. B. Sowerby, Jun.*

"Among oysters from Killinchy, Down, Templeton MSS. Found by Mr. Hyndman and myself in different localities on the North-East coast"—Thompson (*sub C. albus*, Mont.). Belfast Lough—Belf. Mus. Coll. "Living; not uncommon in deep water"—Hyndman.

Chiton cinereus, *Linné.*

"On most parts of the Irish coast"—Thompson. Frequent, living in 15-70 fathoms—Hyndman; and commonly in Strangford Lough, 4-20 fathoms—Dickie (*sub C. asellus*). Carrickfergus—Mr. Swanston.

Chiton albus, *Linné.*

"North coast of Ireland"—Thompson. "Strangford Lough"—Mr. S. A. Stewart. Belfast Lough—Belf. Mus. Coll.

Chiton marginatus, *Pennant.*

Among oysters from Killinchy (Temp. MSS.), in the stomach of a haddock taken at Newcastle, Co. Down, and in other localities on the North-East coast—Thompson (*sub C. fuscatus*, Brown). Though it is a common species generally, neither Hyndman nor Dickie has any note of it. Belfast Lough—Belf. Mus. Coll.

Chiton ruber (*Linné*), *Lowe.*

"Among oysters from Killinchy, Down, Temp. MSS. Found by Mr. Hyndman and myself in different localities on the North-East coast"—Thompson. Living in 15-25 fathoms north of Larne—Hyndman; and in and about Strangford Lough in 7-20 fathoms—Dickie. Belfast Lough—Belf. Mus. Coll.

Chiton lævis (*Pennant*), *Montagu.*

Living, very rare, in Castle Ward Bay, Strangford Lough, 7-20 fathoms—Dickie. Belfast Lough—Belf. Mus. Coll.

Chiton marmoreus, *Fabricius.*

"Obtained in Strangford Lough by Mr. Hyndman and myself. On oysters brought to Belfast market from Carlingford, and Greencastle (Co. Londonderry), W. T.; Bangor, Co. Down, Mr. R. Patterson"—Thompson (*sub C. lævigatus*). Strangford Lough—Mr. S. A. Stewart.

ORDER PECTINIBRANCHIATA.

Patella vulgata, *Linné.*

Between tide marks, on stones and rocks; very common here, as elsewhere. Hyndman dredged dead shells in 27 fathoms on the Turbot Bank. He makes a curious statement about the limpet on the authority of Captain White, Harbour Master—that it is found to be good for eating and wholesome on the outer coast of Co. Down, but that in Strangford Lough it is found not to be wholesome, and is avoided by the people there. There is an interesting paper in the "Annals of Natural History" for June, 1839, by the late Mr. Robert Patterson, F.R.S., on the use of the limpet as food in the North of Ireland, which will well repay perusal.

var. **depressa.** "Living. Coast of Down, in Mr. Hyndman's cabinet"—Hyndman, 1859 Report (*sub P. athletica*). Bangor, Co. Down—Belf. Mus. Coll.

Helcion pellucidum, *Linné.*

Of general occurrence round our shores, on the broad fronds of *Laminaria digitata*, at and near low water mark. Dickie brought up living specimens from as deep as 15 fathoms in Wellstream Bay, Strangford Lough, and Hyndman dredged it dead on the Turbot Bank (*Patella pellucida*).

var. **lævis.** Equally distributed with the typical form, and not separated from it by the authors quoted above.

Tectura testudinalis, *Müller.*

On stones at and below low water mark. Newcastle and Bloody Bridge—Thompson (*sub Lottia testudinalis*). Frequent on both sides of Belfast Lough—Hyndman; and dead specimens were dredged in Strangford Lough by Dickie, and Mr. S. A. Stewart (*Acmœa testudinalis*). This shell was named by Sowerby *Patella Clealandi* in honour of Mr. J. Rose Clealand, of Rathgael House, who procured the first British examples at Bangor, Co. Down; but as a species it proved to have been previously described and named by Müller, from Danish specimens. On stones near the Twin Islands, Belfast Harbour, of large size—Mr. Swanston.

Tectura virginea, *Müller.*

"Obtained on the shore of Belfast Bay by Mrs. M'Gee, and found by Mr. Hyndman adhering to oysters in Belfast Market in 1831"—Thompson (*sub Lottia virginea*). Hyndman took it very frequently, living at the entrance to Belfast Lough, and off Larne, in from 10 to 25 fathoms; and from Dickie's dredgings it would appear to live in abundance in Strangford Lough, in 4 to 25 fathoms (*sub Acmœa virginea*). Dead shells frequent on the Turbot Bank.

Tectura fulva, *Müller.*

Turbot Bank, rare, dead; determined by Dr. Dickie—Hyndman, 1858 Report (*sub Pilidium fulvum*).

Propilidium ancycloides, *Forbes.*

"Obtained by Mr. Hyndman many years ago on oysters from Strangford Lough"—Thompson (*sub Patella ancycloides*). In a dead state it is rather common on the Turbot Bank. The only locality on our shores where it has been certainly taken alive would appear to be the deep water near the Maiden Rocks, where Hyndman procured living specimens several times, in between 70 and 100 fathoms of water. Jeffreys says "on the Antrim Coast in 18-100 fathoms (Hyndman and others)," which looks as if some other observer had taken it at a less depth.

Puncturella Noachina, *Linné.*

"Mouth of Belfast Bay, 27 fathoms, one dead specimen dredged by Mr. Hyndman"—Thompson; his only Irish note of the species. Hyndman subsequently obtained it on several occasions on the Turbot Bank (the same locality), always dead. Jeffreys says of it—"Co. Antrim (Hyndman, Waller, and J.G.J.). The specimens, however, from the last-mentioned locality are probably relics of the glacial epoch, and not recent." It is a species essentially of northern origin, whose most southern station is Scarborough in Yorkshire, while northward it ranges as far as Spitzbergen and North Greenland.

Emarginula fissura, *Linné.*

Common off the South Antrim coast, living in depths varying from 5 fathoms in Belfast Lough to 90 fathoms near the Maiden Rocks—Hyndman; it was not taken alive in Strangford Lough, but was common in a dead state —Dickie (*sub E. reticulata*). Thrown up by the tide on sandy beaches at Castlerock and Magilligan, Co. Derry, and Newcastle, Co. Down—R.Ll.P.

var. **elata.** Jeffreys records this variety, which is larger, more solid, and much higher than the typical form, as taken by him at "Larne near Belfast."

Emarginula rosea, *Bell.*

Hyndman states that this shell was dredged, in a dead state, by Mr. Waller on the Turbot Bank. It is entirely a southern form, inhabiting, as a British species, the Channel Islands and South of England coasts, and its occurrence here as a native would be, to say the least of it, highly improbable.

Emarginula crassa, *J. Sowerby.*

Very rare, living in 60 fathoms off the Copeland Islands; dead in shallower water in the same vicinity, and on the Turbot Bank, and in 70-100 fathoms near the Maidens—Hyndman. Dredged alive off the Maidens—Mr. Swanston. It is a species of great beauty and rarity, inhabiting rocky ground in deep water, where it is almost inaccessible to the dredge.

Fissurella Græca, *Linné.*

"On all the Irish coasts"—Thompson. Living sparingly in 10 to 25 fathoms at various points of the Antrim and Down coasts—Hyndman, and Dickie (*sub F. reticulata*). Portrush—Miss Richardson. Magilligan and Castlerock, Co. Derry, dead—R.Ll.P.

Capulus Hungaricus, *Linné.*

"Generally distributed"—Thompson (*C. Ungaricus*). Not uncommon, living on stones and oyster shells in 10 to 20 fathoms, off Belfast Lough and Larne. In a dead state it has been dredged by Dickie in Strangford Lough, and by Hyndman in the deepest water off the Maidens (100 fathoms). Rather worn shells are thrown ashore by the tide at Magilligan and Newcastle—R.Ll.P. Hyndman and Dickie mention it under Lamarck's generic name of *Pileopsis*. Locally called "fool's cap."

[**Haliotis tuberculata,** *Linné.*

"'Dredged near Groomsport, Co. Down, Oct. 1811,' Templeton, MSS."—Thompson. The two specimens affirmed to have been there obtained are preserved in the Belfast Museum, on a card which bears the following manuscript note by Mr. Robert Templeton:—"These are the two haliotes which rank this shell as a native of Ireland. They were got by the late John Templeton, Esq., I believe on the Co. Down shore—R. T." Jeffreys dismisses this and other records with very little ceremony—"the Irish localities must have been from hearsay, and are manifestly wrong." It would appear probable that the Groomsport specimens were actually obtained there, for

Mr. Templeton's care and accuracy are well known, but they must have been derived from some passing vessel or other extraneous source; this beautiful species inhabits nowhere north of the Channel Islands.]

Scissurella crispata, *Fleming.*

A northern species, frequenting, in Britain, chiefly the Orkney and Shetland Islands. "Mouth of Belfast Bay, 27 fathoms, 2 dead specimens dredged by Mr. Hyndman"—Thompson. In Hyndman's Reports, additional specimens are mentioned as having been obtained on the Turbot Bank, and a single fresh shell was taken in 80 fathoms some 6 miles north of the Maidens.

Cyclostrema nitens, *Philippi.*

Found by Jeffreys in Turbot Bank sand sent to him—Hyndman, 1858 Report (as *Trochus* (*Margarita*) *pusillus*).

Cyclostrema serpuloïdes, *Montagu.*

In Turbot Bank sand, as last (*sub Skenea divisa*); and in his 1859 Report Hyndman records having dredged living examples off Larne.

[**Margarita costulata,** *Möller.*

Found by Mr. Waller in Turbot Bank sand—Hyndman. It is an arctic species, whose southern limit is Iceland. Dead specimens have been dredged in several Scotch localities also, which, with those from the Turbot Bank, must be looked on as relics of the great ice age.]

Trochus helicinus, *Fabricius.*

"Living, common, on *Laminaria digitata, &c.*"—Hyndman. Assuming that *Margarita communis*, Mont. = *M. vulgaris*, Leach, Thompson mentions the loughs of Belfast, Larne, and Strangford as localities. Hyndman dredged dead specimens on the Turbot Bank.

var. **fasciata.** "Found by Mr. Hyndman in the North of Ireland"—Jeffreys.

Trochus Grœnlandicus, *Chemnitz.*

Dredged in a dead state by Hyndman on the Turbot Bank (*sub T.* (*Margarita*) *undulatus*). The specimens were determined by Jeffreys, who, however, remarks that they look suspiciously like fossils from a submarine post-tertiary deposit in the locality. It is an arctic species, which descends as far southward as the north of Scotland.

[**Trochus cinereus,** *Couthouy.*

"Has been dredged by Mr. Waller on the Antrim Coast; but it is a submarine fossil"—Jeffreys. Hyndman also records it, as *Margarita cinerea.*]

Trochus magus, *Linné.*

Not uncommon on the coasts of Derry, Antrim, and Down, living chiefly in about 5 to 10 fathoms.

Trochus tumidus, *Montagu.*

Belfast and Strangford Loughs, and Donaghadee—Thompson. Hyndman dredged it very frequently, living in depths ranging from 10 to 100 fathoms,

and from Dickie's lists it would appear to live in profusion in Strangford Lough.

Trochus cinerareus, *Linné.*

One of our most common species, living on stones and sea-weed between tide-marks and in depths up to 25 fathoms, throughout the province. Hyndman dredged a single living specimen in the great depth of 70-90 fathoms off the Maidens. It is locally called "silver-shell," on account of the pearly lustre of the inner layers. The *T. littoralis*, Brown, for which Thompson, quoting from an older writer, mentions Killough as a station, belongs to the present species, and, according to Jeffreys, can scarcely be considered a variety.

Trochus umbilicatus, *Montagu.*

Between tide-marks, among stones and *Fuci;* common.

Trochus Duminyi, *Requien.*

Our rarest shell, Bundoran in Donegal Bay being its only British habitat. It appears to be of rather rare occurrence there, where it was first discovered some years ago by Edward Waller, an assiduous and distinguished Ulster conchologist.

Trochus lineatus, *Da Costa.*

"This littoral species, found on rocks, stones, &c., is unknown to me further north on the Eastern line of coast than Ballywalter, Co. Down ($54\frac{1}{2}°$ lat.). Southward it is common"—Thompson (*sub Monodonta crassa*). On the western side of the province it flourishes at Bundoran, in just the same latitude—Waller, Jeffreys, and others.

Trochus Montacuti, *W. Wood.*

Sparingly but widely distributed on the Antrim and Down shores. Hyndman dredged it alive off Ballygalley Head, Waller off Groomsport, and Dickie in Strangford Lough and the open channel adjoining—depths ranging from 12 to 25 fathoms; in a dead state it occurred frequently, especially on the Turbot Bank (*sub T. Montagui*). A very elegant scalariform monstrosity was dredged off Larne, as noted by Hyndman and Jeffreys.

Trochus striatus, *Linné.*

"Dead, in Turbot Bank sand, Mr. Jeffreys"—Hyndman, 1859 Report; specimens from that locality are in the Belfast Museum Collection. In his "British Conchology," the most northern station which Jeffreys gives is Dublin Bay. It is a southern species, and frequents the Channel Islands and south coasts of England and Ireland.

[**Trochus exasperatus,** *Pennant.*

"Turbot Bank, Dr. Dickie, doubtful"—Hyndman, 1857 Report (*sub T. exiguus*). This is the only note of the occurrence of the present species. Jeffreys regards as doubtful all localities other than those on the South of England coasts and Channel Islands.]

Trochus millegranus, *Philippi.*

Of not uncommon occurrence, living in depths varying from 10 fathoms in Belfast Lough to 100 fathoms at the Maiden Rocks; Dickie includes it in his lists of Strangford Lough shells. Thompson says—"It inhabits the deeper portions of Belfast and Strangford Loughs, chiefly from 10 to 23 fathoms, in sand ooze, &c. Bundoran, Mrs. Hancock. *T. Clelandi*, Wood, is considered another variety. It was sent to the Author from Strangford Lough by James Rose Clealand, Esq." Dredged at Glenarm, Mr. S. A. Stewart.

Trochus granulatus, *Born.*

This handsome shell, the largest British *Trochus*, is of extreme rarity in our province. "Two broken specimens dredged up at separate times in Belfast Bay; but as there are only two other examples known of its being found so far from its usual southern habitat, these have been no doubt introduced accidentally"—Hyndman, 1857 Report. "Fragments in 25 fathoms, 2 miles off Black Head"—*Ibid.*, 1858 Report. It has been dredged off the Mull of Galloway, and at Sanda Island, opposite the Antrim coast, so its occurence on our shores is not improbable. I find the following marginal note in Mr. Wm. Swanston's copy of Thompson's work, opposite the name (*T. papillosus*, Brown) of this species: "One living and one dead, S.E. of Maidens, 72 fathoms, 11th Sept., 1882—W. S." The specimens are in Mr. Swanston's cabinet, and are fine and characteristic examples.

Trochus zizyphinus, *Linné.*

A pretty and well-known species, which is distributed throughout our waters, and has been taken alive at all depths. It flourishes most in from about 5 to 25 fathoms.

var. **Lyonsii.** "The pure white variety has been dredged of all sizes, but very sparingly, in Belfast Lough by Mr. Hyndman and myself; on one occasion we found numbers of this variety on the beach at Ardmillan (Strangford Lough), whence they were brought adherent to "wrack" (*Fuci*) cut for manure about some of the islands"—Thompson. Hyndman took it living in from 20 to 90 fathoms off Larne, and Dickie in Strangford Lough.

var. **elata.** "Deep water on the coast of Antrim (J. G. J.)"—Jeffreys.

Phasianella pulla, *Linné.*

"Littoral in some localities; dredged in from about 6 to 10 fathoms in Belfast Bay, common"—Thompson. Living, frequent, near low water mark—Hyndman; it was dredged by him alive in as deep as 20 fathoms on the Cod Bank off Larne. In a dead state it is abundant in the shell sand of the Turbot Bank, and Dickie records it from Strangford Lough.

Lacuna crassior, *Montagu.*

Frequent, ranging from low water mark to the deepest water at the Maidens. Thompson and Dickie took it in Strangford Lough.

Lacuna divaricata, *Fabricius.*

A common species. "The var. *L. vincta* is not uncommon; *L. canalis* is

more so"—Thompson (*sub L. quadrifasciata*). "Common on *Laminaria*"—Hyndman (*sub L. vincta*). Abundant in Turbot Bank sand, in a dead state.

Lacuna puteolus, *Turton.*

Apparently rare. Dredged by Hyndman, in a dead state, on the Turbot Bank, and near Ballygalley Head. Strangford Lough—Mr. S. A. Stewart. Bundoran—Belf. Mus. Coll.

var. **conica.** "Co. Antrim (Hyndman)"—Jeffreys.

Lacuna pallidula, *Da Costa.*

"Inhabits the laminarian region in Belfast and Strangford Loughs, and chiefly found on the broad fronds of *Laminaria digitata*; also on oysters; occurs but sparingly; procured in some quantity at Ballycastle by the Rev. Thomas Hincks"—Thompson. "Living, common, on *Laminaria*"—Hyndman. Magilligan—Belf. Mus. Coll.

Littorina obtusata, *Linné.*

Abundant on stones and *Fuci* on all beaches. Hyndman dredged dead shells on the Turbot Bank (*L. littoralis*). "Common around the shores"—Thompson (*L. Neritoides*, Forbes).

var. **neritiformis.** "Captain Brown has given Downpatrick as an Irish locality"—Jeffreys.

var. **fabalis.** "I have found it plentifully at Larne in the North of Ireland. I believe it represents the young males of the ordinary form"—Jeffreys.

Littorina neritoides, *Linné.*

On rocks and stones above high water mark; common. Bundoran—Thompson (*L. petræa*, Mont.).

Littorina rudis, *Maton.*

Plentiful on stony beaches everywhere.

var. **saxatilis.** "North of Ireland"—Thompson (*L. saxatilis*).

var. **jugosa.** "Is common on all quarters of the rocky coasts"—Thompson (*L. jugosa*).

var. **patula.** "Living, common, on rocky ground a little below high water mark"—Hyndman (*L. patula*). Is this correct? Jeffreys gives only three stations in Britain—Eddystone, Penzance, and Unst.

var. **tenebrosa.** "Although met with on all sides of the coast, it is local"—Thompson (*L. tenebrosa*). It is an estuarine form, and occurs on our *Zostera* banks. Larne Lough—Hyndman. Fair Head—Belf. Mus. Coll.

Littorina litorea, *Linné.*

In the greatest abundance on stones and mud banks. "Abundant round the shores of the Island"—Thompson (*L. communis*, Turt. Br.).

var. **turrita.** Belfast Lough, Mr. S. A. Stewart—Belf. Mus. Coll.

Genus **Rissoa,** *Fréminville.*

Of this large genus of tiny shells, out of the 25 species which Jeffreys in-

cludes in the British catalogue, 20 are recorded as occurring in our province. The *Rissoæ*, and that other large genus of small univalves, the *Odostomiæ*, will serve as good examples of the richness in the smaller univalves of that interesting area of sand and gravel which is known as the Turbot Bank. Thus, of the 20 species of *Rissoa* found in the district, 18, or all but 2, occur in the shell-sand from this vicinity, about half of these being inhabitants of the littoral and laminarian regions, while the other half frequent the coralline and deep-sea zones. As regards *Odostomia*, to be mentioned presently, we have 24 species, out of 34 British, of which no less than 21 occur in the Turbot Bank sand, and 10 of these have not been obtained elsewhere in our waters. As suggested by Mr. Hyndman, the home of the majority of this large number of species, whose deserted habitations bestrew the Turbot Bank, is probably the profound rocky depths near the Maidens, where they may live, out of reach of the trawl and dredge.

NOTE.—Except where otherwise stated, the shells referred to in the notes on species of *Rissoa*, were dead.

Rissoa striatula, *Montagu.*

Bundoran—Thompson. Frequent on the Turbot Bank—Hyndman.

Rissoa cancellata, *Da Costa.*

Of frequent occurrence on the Turbot Bank—Hyndman. Dredged in Strangford Lough, and the open channel adjoining—Dickie. (Both *sub R. crenulata*).

Rissoa calathrus, *Forbes & Hanley.*

Turbot Bank, rare—Hyndman.

Rissoa reticulata, *Montagu.*

Common on the Turbot Bank—Thompson, and Hyndman. Common, 7-20 fathoms, Castle Ward Bay, Strangford Lough—Dickie. (All *sub R. Beanii*). In shell-sand dredged near Ardmillan in the latter lough—R.Ll.P.

Rissoa cimicoides, *Forbes.*

"Larne, Co. Antrim (J.G.J.)"—Jeffreys. The Turbot Bank is probably the locality intended. Specimens in the Belfast Museum Collection are labelled as from Larne.

Rissoa punctura, *Montagu.*

Bundoran—Thompson. Common on the Turbot Bank—Hyndman.

Rissoa Zetlandica, *Montagu.*

On the Turbot Bank—Hyndman. Specimens from thence are in the Belfast Museum Collection.

Rissoa costata, *Adams.*

Bundoran—Thompson. On the Turbot Bank, and in about 20 fathoms off Ballygalley Head—Hyndman. Strangford Lough—Dickie, and R.Ll.P.

Rissoa parva, *Da Costa.*

"A very common species around the coast"—Thompson. It lives in

profusion on *Zostera* and *Algæ* at low water mark and a few fathoms depth. Dead on the Turbot Bank and elsewhere.

var. **interrupta.** Common around the coast—Thompson (*R. interrupta*).

Rissoa inconspicua, *Alder.*

"One specimen at Bundoran, Mrs. Hancock"—Thompson. Frequent on the Turbot Bank—Hyndman.

Rissoa albella, *Lovén.*

Turbot Bank; from Hyndman's collection—Belf. Mus. Coll. I find no note of it in Hyndman's Reports. If the determination of the species be correct, the specimens probably belong to the variety *Sarsii*, which is abundant along the west coast of Scotland; the typical form is confined to Bantry Bay, according to Jeffreys.

Rissoa membranacea, *Adams.*

"Bundoran, Warren. On muddy banks, within and below low water, it is common and fine in Belfast Bay"—Thompson, who remarks that he is informed that this species lives on the leaves of the "sleech-grass" (*Zostera marina*), and never, like other *Rissoæ*, on *Fuci*. A common species, living on *Zostera* banks throughout the district. Dead on the Turbot Bank, and in deep water in and outside of Strangford Lough—Hyndman, and Dickie. (*R. labiosa* by all).

Rissoa violacea, *Desmarets.*

Bangor, Belfast Bay—Thompson. "Living, scarce, on sea-weed between tide-marks"—Hyndman. Dead, common, Castle Ward Bay, Strangford Lough—Dickie. (All *sub R. rufilabrum*). It is one of the two North of Ireland *Rissoæ* which alone are not recorded from the Turbot Bank.

Rissoa striata, *Adams.*

This tiny shell swarms around our shores, on sea-weeds, stones, and mud, between tide-marks. Common also, in a dead state, in up to 30 fathoms of water on the Antrim and Down coasts.

Rissoa proxima, *Alder.*

"Magilligan (W.T.); Bundoran (Mrs. Hancock)"—Thompson. Turbot Bank, very rare—Hyndman. It is a rare and critical species, and as it has a southern distribution, and Dublin is the most northern station given by Jeffreys, it is possible that Thompson's localities belong to the following species.

Rissoa vitrea, *Montagu.*

Turbot Bank, extremely rare—Hyndman.

Rissoa fulgida, *Adams.*

"I have found it sparingly at Larne Lough, near Belfast"—Jeffreys.

Rissoa soluta, *Philippi.*

In Turbot Bank sand, very rare—Hyndman. Specimens from thence are in the Belfast Museum Collection.

Rissoa semistriata, *Montagu.*

"*R. semistriata* has come under my inspection in shell-sand from Magilligan and Bundoran"—Thompson. On the Turbot Bank, rare—Hyndman.

var. **pura.** Observed in Turbot Bank sand by Mr. Jeffreys—Hyndman (*sub* var. *alba*).

Rissoa cingillus, *Montagu.*

On all sides of the coast"—Thompson (*R. cingilla*). "Living, common, under stones near low water mark"—Hyndman. Dead shells in the deeper water.

var. **rupestris.** "North-East coast, Mr. Hyndman and W. T., not rare" —Thompson. Turbot Bank, rare—Hyndman.

[**Rissoa Bryerea,** *Montagu.*

"Among shell-sand from Magilligan, one procured by Mr. Hyndman"—Thompson. This is *Rissoina Bryerea*, a West Indian species, stray examples of which have been occasionally found at different places in the British Isles.]

[**Rissoa dispar** (Turbo dispar, *Montagu*).

Thompson, quoting from Brown, says that this species has been met with on the rocks near the Giant's Causeway. It is *Littorina dispar*, a West Indian shell, and has no claim to be considered British.]

Hydrobia ulvæ, *Pennant.*

Swarming on *Zostera* banks and muddy sands in all our bays and estuaries, between tide marks. Dead on the Turbot Bank—Hyndman (*Rissoa ulvæ*). In summer it is the chief food of the grey mullet. In winter various sea-birds feed on it.

Barleeia rubra, *Montagu.*

"Among sea-weed brought from Tory Island, off the north coast of Donegal, by Mr. Hyndman, in 1845, this species was found"—Thompson (*sub Rissoa rubra*). "Bundoran, Co. Donegal (J.G.J.)"—Jeffreys. Specimens from the latter station are in the Belfast Museum.

Jeffreysia diaphana, *Alder.*

"In shell-sand collected at Bundoran by Mrs. Hancock, in 1840"—Thompson (*sub Rissoa albella*, Alder).

Skenea planorbis, *Fabricius.*

This tiny shell abounds on *Zostera* and *Algæ* between tide-marks. Abundant in Belfast and Strangford Loughs; Bundoran, Mr. Warren—Thompson (*sub S. depressa*). Larne Lough—R.Ll.P. Dead shells in Turbot Bank sand —Hyndman.

var. **trochiformis.** Larne Lough—Jeffreys. This is the convex-spired variety mentioned by Hyndman in his 1859 Report.

Homalogyra atomus, *Philippi.*

"Living on *Zostera marina*, shores of Larne Lough"—Hyndman (*sub Euomphalus nitidissimus*). "Donegal in Ireland (Warren)"—Forbes and

Hanley (*Skenea nitidissima*). Belfast Lough—Belf. Mus. Coll. Has probably been passed over on account of its very minute size; it would seem to be a common species generally.

Homalogyra rota, *Forbes & Hanley.*

"This rare species has been taken in Donegal by Mr. Warren and Mr. Barlee"—Forbes & Hanley (*sub Skenea? rota*). It is the smallest known species of British shells, having a length, according to Jeffreys, of only 0·0115 inch, and is rare.

Cæcum trachea, *Montagu.*

Turbot Bank; from Hyndman's collection—Belf. Mus. Coll. "Strangford (Waller)"—Jeffreys (supplement).

Cæcum glabrum, *Montagu.*

"Shell-sand, deep water, Belfast Bay, Mr. Hyndman"—Thompson (*sub Brochus lævis*). Rare, in shell-sand from the Turbot Bank—Hyndman. These refer to the same station, and are the only notes of the occurrence in our district of the species, which Jeffreys says is common and universal; its insignificant size may account for this.

[**Brochus reticulatus** of Brown is the young of his *B. annulatus*, which is an exotic shell. It is said to have been found in Strangford Lough.].

Turritella terebra, *Linné.*

Very common, living in 7 to 25 fathoms throughout our waters. Thompson says Mr. Hyndman observed it living between tide-marks in Carlingford Lough. In Lough Foyle the dead shells of this species constitute a large part of the great shell-banks for which the place has long been noted.

[**Truncatella truncatula,** *Draparnaud.*

"A specimen agreeing with Montagu's description of *Turbo subtruncata*, but not very well with his figure, was found among shell-sand collected at Bundoran by Mrs. Hancock"—Thompson (*sub T. Montagui*). "I fear there has been some mistake as to the specimen from this place"—Jeffreys. Its British distribution only extends to the south coast of England and the Channel Islands, and its foreign range is entirely southern.]

Scalaria Turtonæ, *Turton.*

"At Newcastle, Co. Down, this shell has been met with by Dr. Drummond"—Thompson. This station is given also by Forbes and Hanley, and Jeffreys, on Thompson's authority. Strangford Lough—Mr. S. A. Stewart. As a pleistocene fossil it is of common occurrence in the Estuarine Clays at Belfast; perhaps the specimens labelled "Belfast Lough" in the Museum Collection were thus derived.

Scalaria communis, *Lamarck.*

"Although not yet (so far as I am informed) taken in the Loughs of Strangford or Belfast, it has been procured in the adjacent Lough of Larne; Bundoran, Mrs. Hancock"—Thompson (*sub S. clathrus*). Turbot Bank, dead, rare—Hyndman. Magilligan—Belf. Mus. Coll.

Scalaria Trevelyana, *Leach.*

"Mr. Hyndman possesses a specimen from Magilligan"—Thompson; a specimen from thence, out of Mr. Thompson's collection, is in the Belfast Museum. It does not appear to have been taken elsewhere in the province.

Scalaria clathratula, *Adams.*

"Bundoran, Mrs. Hancock"—Thompson; specimens from thence are in the Belfast Museum. Hyndman dredged dead shells on several occasions, in the vicinity of the Turbot Bank.

[**Acirsa borealis,** *Beck.*

"Dead, in Turbot Bank sand, Mr. Waller, 1857. Described by him in the "Transactions of the Royal Dublin Society," and provisionally named *Turritella Hibernica*"—Hyndman (*sub Scalaria Eschrichti*). "Dredged in 18-20 f. off the coast of Antrim, by Mr. Hyndman, Mr. Waller, and myself. This species has not been found living south of Iceland"—Jeffreys.]

Aclis unica, *Montagu.*

"Bundoran, Mrs. Hancock. Deep water, Belfast Bay, Mr. Hyndman" —Thompson (*Chemnitzia unica*). Turbot Bank, dead, very rare—Hyndman. It is a littoral species.

Aclis ascaris, *Turton.*

"Bundoran (Mrs. Hancock, *fide* Thompson)"—Jeffreys.

Aclis supranitida, *S. Wood.*

"It has been collected at Bundoran by Mrs. Hancock"—Thompson (*sub Chemnitzia glabra*). Hyndman dredged dead shells occasionally in the vicinity of the Turbot Bank.

Aclis Gulsonæ, *Clark.*

In Turbot Bank sand, determined by Mr. Jeffreys—Hyndman (*Jeffreysia Gulsonæ*). Specimens from the Turbot Bank are in the Belfast Museum.

var. **tenuicula.** "Lough Strangford (Waller)"—Jeffreys.

Genus **Odostomia,** *Fleming.*

This, the largest and perhaps the most complicated genus of British shells, has by no means been worked out in our district. With the assistance of that eminent conchologist, Mr. Jeffreys, Hyndman was enabled to publish very full lists of the *Odostomiæ* of the Turbot Bank, and of the 34 British species, no less than 21 are recorded from this vicinity, all in a dead state; but beyond this, there is a paucity of information concerning them. Their minute shells are easily overlooked, and it is only with the aid of the microscope that the exquisite sculpture which characterises many of the species, may be seen with advantage. In the absence of records of any of the following species having been taken alive, I have omitted noting "dead" after each station.

Odostomia nivosa, *Montagu.*

"Turbot Bank sand Mr. Jeffreys"—Hyndman (*sub O. cylindrica*).

Odostomia truncatula, *Jeffreys.*

A single specimen found among Turbot Bank sand by Mr. Jeffreys; and later it was dredged in 25 fathoms off Black Head—Hyndman; specimens from thence are in the Belfast Museum. It is a very rare species, and its other British stations are all on the South of England coasts.

Odostomia Lukisi, *Jeffreys.*

"Bundoran, Co. Donegal, in drift shell sand (Waller)"—Jeffreys.

Odostomia rissoides, *Hanley.*

Found by Jeffreys in Turbot Bank sand—Hyndman. Bundoran—Belf. Mus. Coll. It is a littoral species, and is distributed throughout the British coasts.

var. **alba.** Turbot Bank, Mr. Waller—Hyndman (*sub O. alba*).

var. **nitida.** Found by Jeffreys in Turbot Bank sand—Hyndman (*sub O. nitida*).

var. **dubia.** As last (*sub O. dubia*).

Odostomia pallida, *Montagu.*

"A very few individuals of this species have been dredged in Belfast Bay, and taken in the stomach of the grey mullet captured there; under stones between tide marks. Strangford Lough, on soft sand and ooze"—Thompson. Dredged in the vicinity of the Turbot Bank on several occasions—Hyndman (*sub O. eulimoides*). In shell sand dredged near Ardmillan in Strangford Lough—R.Ll.P. It is one of the commoner *Odostomiæ*, and lives on the ears of *Pecten opercularis* and *P. maximus*, in the coralline zone; the littoral habitat assigned above by Thompson for the species, casts some doubt on the correctness of his determination.

Odostomia acuta, *Jeffreys.*

From the Turbot Bank; determined by Mr. Alder—Hyndman.

Odostomia conspicua, *Alder.*

As last; like it, it is an inhabitant of the coralline zone (15-50 fathoms).

Odostomia unidentata, *Montagu.*

"More frequent in the shell sand that has come under my notice than any other species of *Odostomia*"—Thompson; he mentions Strangford Lough as a locality. Hyndman took it several times on the Turbot Bank, and Dickie off the entrance to Strangford Lough. Twin Islands in Belfast Harbour—Mr. Swanston.

Odostomia turrita, *Hanley.*

Turbot Bank, Mr. Waller—Hyndman (*sub O. unidentata* var. *turrita*).

Odostomia plicata, *Montagu.*

"It has been found in Belfast Bay and Strangford Lough by Mr. Hyndman and myself; at Bundoran by Mrs. Hancock"—Thompson. Rare, off Bangor, and on the Turbot Bank—Hyndman. Jeffreys gives no northern stations for the present species, and says that *O. turrita* has been often mistaken for it.

Odostomia insculpta, *Montagu.*

Observed by Jeffreys in Turbot Bank sand which was sent to him for examination—Hyndman.

Odostomia obliqua, *Alder.*

"Two specimens obtained from shell sand collected at Bundoran by Mrs. Hancock"—Thompson.

Odostomia Warreni, *Thompson.*

"A specimen from Bundoran, Mrs. Hancock"—Thompson (*sub Rissoa Warrenii*). Turbot Bank, Mr. Waller—Hyndman. In the body of Jeffreys' "British Conchology" it appears as *O. obliqua* var. *Warreni*, but in the Supplement to that work it is restored to the rank of a species. It was first described by Mr. Thompson in the "Annals of Natural History," from specimens found at Portmarnock by Mr. T. W. Warren, an assiduous Irish conchologist, in whose honour Mr. Thompson named it as above.

Odostomia decussata, *Montagu.*

This beautiful little shell has been found in Turbot Bank sand by Mr. Jeffreys. Specimens labelled "Co. Antrim" are in the Belfast Museum Collection.

Odostomia indistincta, *Montagu.*

Bundoran, Mrs. Hancock—Thompson. On the Turbot Bank on several occasions—Hyndman. In Strangford Lough and the channel adjoining, very rare—Dickie. (All *sub Chemnitzia indistincta*).

Odostomia interstincta, *Montagu.*

It would appear to be of common occurrence in the Turbot bank shell sand (*Chemnitzia interstincta*), but is not noted elsewhere. A widely distributed and common species generally.

Odostomia spiralis, *Montagu.*

"Very sparingly, in shell sand collected at Magilligan by Miss Moody"—Thompson. Common on the Turbot Bank—Hyndman. Entrance to Strangford Lough, 12-15 fathoms, very rare—Dickie.

Odostomia excavata, *Philippi.*

"Bundoran, Mr. Warren"—Thompson (*sub Rissoa Harveyi*). Turbot Bank, Mr. Waller—Hyndman. Mr. Thompson named it *R. Harveyi* in honour of Dr. W. H. Harvey, who discovered the first British examples, in Co. Clare; Dr. Harvey had previously named it *Cingula sculpta*. Both these proved to be subsequent to Philippi's name of *R. excavata*.

Odostomia scalaris, *Philippi.*

Found in Turbot Bank sand by Mr. Jeffreys—Hyndman (*Chemnitzia scalaris*). Dickie records it from Strangford Lough, but from a remark in Jeffreys' work, it would appear that it was the following variety which he obtained there.

var. **rufescens.** Rare, off Groomsport (Waller); and dredged on the Turbot

Bank—Hyndman (*sub Chemnitzia rufescens*). "Lough Strangford (Dickie)" —Jeffreys.

Odostomia rufa, *Philippi.*

var. **fulvocincta.** Turbot Bank, rare; determined by Mr. Alder—Hyndman (*Chemnitzia fulvocincta*). Bundoran—Belf. Mus. Coll. The *Chemnitzia rufa* of Hyndman's 1858 Report, in Jeffreys' list of Turbot Bank shells, in all probability belongs to the variety; the typical form is exclusively southern, while the variety has a northern distribution.

Odostomia lactea, *Linné.*

Not uncommon—Thompson. Dredged frequently around the Turbot Bank by Hyndman, and in Strangford Lough and the open channel adjacent by Dickie (all *sub Chemnitzia elegantissima*). Twin Islands in Belfast Harbour—Mr. Swanston. Bundoran—Belf. Mus. Coll. It is a common but beautiful species, inhabiting the laminarian zone.

Odostomia Scillæ, *Scacchi.*

Both Waller and Hyndman dredged this shell on the Turbot Bank (*Eulimella Scillæ*). Jeffreys, referring to this station, says "perhaps from a post-glacial deposit." Specimens from the Turbot Bank are in the Belfast Museum, and look quite as recent as the majority of the shells from that vicinity.

Odostomia acicula, *Philippi.*

Found in Turbot Bank sand by Mr. Jeffreys—Hyndman (*sub Eulimella acicula*). The collection in the Belfast Museum contains specimens from that locality.

var. **ventricosa.** Turbot Bank, Mr. Waller—Hyndman (*sub Eulimella affinis*).

var. **obeliscus.** "Dredged by Mr. Waller on the north-east coast of Ireland" —Jeffreys. Possibly this and the previous note refer to the same specimens.

Odostomia nitidissima, *Montagu.*

"Specimens from Bundoran have come under my inspection"—Thompson (*Chemnitzia nitidissima*).

Ianthina rotundata, *Leach.*

This beautiful oceanic species, popularly known as the "blue snail," is occasionally wafted to our shores by the western winds, during the autumn months. Thompson mentions having obtained a few shells, still containing the animal, on the beach at Groomsport in Co. Down, in the year 1836 (*sub I. communis*), but it is very rarely that it is found so far south in the channel. On the north coast of Antrim, and on the coast of Derry, it is of more frequent occurrence, and is occasionally washed in in quantity. I am informed that after October gales the strand at Bush-foot is sometimes thickly strewn with it. Portrush, occasionally—Miss Richardson, and R.Ll.P.

Eulima polita, *Linné.*

About the entrance of Belfast Bay (Ordnance Survey Collectors and Mr. Hyndman), and in Strangford Lough (Mr. Hyndman and W. T.), bottom

pure sand in each case—Thompson. Hyndman records dead shells only, which appear to be of frequent occurrence in the neighbourhood of the Turbot Bank. Dickie dredged a few living examples off the entrance to Strangford Lough, in 12-15 fathoms, and dead specimens inside the lough. Off Bangor, in 8 fathoms, living—Mr. Swanston.

Eulima distorta, *Deshayes.*

Bundoran, Mrs. Hancock—Thompson. Dead shells are not unfrequent on the Turbot Bank, according to Hyndman.

var. **gracilis.** Dredged by Hyndman on the Turbot Bank, and by Dickie in 12-15 fathoms outside Strangford Lough.

[**Eulima subulata,** *Donovan.*

Stated by Thompson to have been obtained at Bundoran, Co. Donegal, and Dundrum, Co. Down, but there is no doubt that *E. bilineata* is the species intended.]

Eulima bilineata, *Alder.*

"Dredged from a sandy bottom, 8-10 fathoms, off Dundrum, Co. Down, Mr. Hyndman and W.T.; a specimen at Bundoran, Mr. Warren"—Thompson (*sub E. subulata*). Dead shells are common on the Turbot Bank—Hyndman. Living, very rare, in 7-20 fathoms, in Strangford Lough, and dead in the channel adjoining—Dickie.

Natica Islandica, *Gmelin.*

Dead; a single young specimen by Mr. Jeffreys"—Hyndman, 1859 Report (*sub N. helicoides*). The locality is not given, but was probably the Turbot Bank. This specimen may have been a quaternary fossil. It is a northern species, which in Britain is taken chiefly on the northeast coasts, though it has been found at Cork. It is widely distributed in post-glacial beds.

[**N. Grœnlandica,** *Beck.*

A shell from the Turbot Bank is in Thompson's collection in the Belfast Museum. Any specimens occurring there are not recent, but relics of the glacial epoch; Jeffreys records it also as dredged on the Turbot Bank, and enters it as a fossil. Its present habitat in Britain is limited to rather deep water off the northeast coasts of England and Scotland.]

Natica sordida, *Philippi.*

Strangford Lough and the channel adjoining are the only localities in which this species has been obtained in the North of Ireland. Here Dickie dredged it on several occasions, but only in a dead state, in depths varying from 10 to 25 fathoms; specimens from the same locality are in Thompson's collection in the Belfast Museum.

Natica catena, *Da Costa.*

One of our commoner shells, living chiefly in sandy bays at a few fathoms depth. "Living, common, 6-8 fathoms, from Bangor to Donaghadee"—Mr. S. A. Stewart. Thrown up alive, and of large size, on Magilligan Strand,

Co. Derry—R.Ll.P. Dead shells were dredged in some abundance around Belfast and Strangford Loughs by Hyndman and Dickie, in from 15 to 30 fathoms (*N. monilifera*).

Natica Alderi, *Forbes.*

This very pretty shell is common, living at nearly all depths (4 to 90 fathoms) throughout the waters dredged by Hyndman and Dickie (*N. nitida*), and thrown up on sandy beaches throughout the province.

Natica Montacuti, *Forbes.*

Thompson records a living specimen dredged in Belfast Bay. Hyndman took it alive off Larne, at different depths up to 90 fathoms, and dredged dead shells in abundance around the entrance to Belfast Lough, in 15 to 30 fathoms (*sub N. Montagui*). It did not occur in any of Dickie's dredgings.

[**Natica clausa,** *Broderip & Sowerby.*

Dredged by Hyndman and Jeffreys on the Turbot Bank. It is a glacial fossil, and now inhabits the circumpolar seas alone.]

Adeorbis subcarinatus, *Montagu.*

Dredged up from the Turbot Bank by Hyndman, in a dead state, on several occasions; it is a southern shell, and has not been found elsewhere in our district.

Lamellaria perspicua, *Linné.*

"Generally distributed"—Thompson (*Sigaretus perspicuus*). Rare, living on *Laminaria*, and dredged alive in the unusual depth of 80 fathoms north of the Maidens, and dead in 15-25 fathoms off Ballygalley Head—Hyndman. Very rare, dead, in 15-25 fathoms off the entrance to Strangford Lough—Dickie. *Sigaretus tentaculatus*, recorded by Thompson as dredged by Mr. Hyndman and himself in Strangford Lough, is the male of the present species; the typical form is the female.

Velutina lævigata, *Pennant.*

A species of frequent occurrence, living on hard ground at all depths. Hyndman took it alive in 12 to 20 fathoms off Belfast Lough, and in 70-90 fathoms near the Maidens; and in a dead state on the Turbot Bank. Dead, rare, in 6 to 8 fathoms, off Bangor—Mr. S. A. Stewart. It did not occur in Dickie's dredgings, probably owing to the muddy nature of the bottom in Strangford Lough. Thrown up by the tide at Newcastle, Portrush, and Magilligan—R.Ll.P.

var. **candida.** Jeffreys found this white variety on the coast of Antrim.

Trichotropsis borealis, *Broderip & Sowerby.*

In Hyndman's Reports for 1857 and 1858, this species is noted as occurring in a dead state in almost every haul of the dredge made around the entrance to Belfast Lough, and on the Turbot Bank especially; in the 1859 Report he records having obtained it alive in the latter place. Dead shells also occurred to him in the deepest water at the Maidens. Dickie dredged a

single dead specimen in 12-15 fathoms off the entrance to Strangford Lough.

Aporrhais pes-pelecani, *Linné.*

A well-known and common species, locally called "leg-of-mutton shell." It lives in about 10 to 25 fathoms, but is sometimes taken at both less and greater depths.

[**Cerithium metula,** *Lovén.*

In dredged sand from the Turbot Bank—Hyndman, 1859 Report. Erroneously recorded from the same vicinity in the 1857 Report; *Cerithiopsis pulchella* was the species intended. It is a northern form, and its only British station is the Shetland fishing-banks, where it lives in 45-96 fathoms (Jeffreys); the Turbot Bank specimens are manifestly fossil.]

Cerithium reticulatum, *Da Costa.*

Very common, living between tide-marks and to a few fathoms depth, everywhere. In a dead state it is common on the Turbot Bank.

Cerithium perversum, *Linné.*

"In shell sand, mouth of Belfast Bay, Mr. Hyndman"—Thompson (*sub Triphoris adversus*). Not uncommon in Turbot Bank sand—Hyndman; very rare, in 12-15 fathoms, off the entrance to Strangford Lough—Dickie (*sub C. adversum*); in all instances dead. Specimens labelled "Bundoran" are in the Belfast Museum Collection.

ORDER SIPHONOBRANCHIATA.

Cerithiopsis tubercularis, *Montagu.*

"Sandy beach at Magilligan; and in stomach of Scaup duck shot in Belfast Bay"—Thompson (*sub Cerithium tuberculare*). Hyndman several times dredged dead shells on the Turbot Bank.

Cerithiopsis pulchella, *Jeffreys.*

Found by Mr. Waller in Turbot Bank sand—Hyndman. It is a rare species.

[**Cerithiopsis costulata,** *Möller.*

Another of the Turbot Bank fossils; it was dredged there by Waller and Hyndman (*sub Skenea costulata* and *Cerithium niveum*) and specimens from thence are in the Belfast Museum. It inhabits the northern seas, and Shetland appears to be its most southern station.]

Purpura lapillus, *Linné.*

Very common, on rocks and stones, between tide-marks. Locally called "white wilk," or "dog wilk." Dead shells occur on the Turbot Bank.

Buccinum undatum, *Linné.*

The common whelk, or "buckie," as it is locally called, is abundant

on all kinds of ground and at all depths, from half-tide down to 100 fathoms, the limit of the British fauna.

var. **littoralis.** Carrickfergus—Belf. Mus. Coll. It is probably common.

var. **striata.** Living in 60 fathoms about 6 miles from the Maidens—Hyndman.

[**Buccinum cyaneum.**

"A fragment only, considered by Mr. Jeffreys to be this species, in Turbot Bank sand, Mr. Waller"—Hyndman, 1858 Report. I have failed to trace this species to a modern synonym; it is probably some glacial fossil.]

Murex erinaceus, *Linné.*

"Of general occurrence"—Thompson (*Triton erinaceus*). Jeffreys, after giving a list of British stations, remarks "all the specimens procured from the northern coasts were dead;" and this remark applies to our province, for, though it is of frequent occurrence on the shore, and in depths up to 30 fathoms, I find no note of its having been taken alive.*

Trophon muricatus, *Montagu.*

Hyndman dredged it alive on the Cod Bank off Larne (20 fathoms), and also in 25 fathoms off Black Head, but very sparingly; and took it rather commonly in a dead state off Donaghadee, and on the Turbot Bank, and in 70-100 fathoms near the Maidens. From Dickie's Report, dead shells appear to be distributed throughout Strangford Lough and the channel adjacent. Jeffreys queries these and other northern records, and considers that they are probably referable to *T. Barvicensis.* The present species has its head-quarters in Lusitanian and Mediterranean waters, and does not range north of Britain.

Trophon Barvicensis, *Johnston.*

Hyndman obtained it living with the last in the two stations mentioned, and dead in 8-10 fathoms in Belfast Lough, and on the Turbot Bank. Dickie dredged a few dead specimens in 12-15 fathoms outside Strangford Lough. This is a northern form, ranging to the arctic seas, and not found south of Britain.

Trophon truncatus, *Ström.*

"On all parts of the Irish coast"—Thompson (*sub Fusus Bamffius*). Living in from 6 to 25 fathoms around Belfast Lough, and in much deeper water (70-90 fathoms) off the Maidens, and common in a dead state in from 12 to 100 fathoms—Hyndman. Very rare, dead, in Strangford Lough and the channel adjoining—Dickie. (Both *sub T. clathratus.*)

[**Fusus scalariformis,** recorded by Hyndman as found in Turbot Bank sand by Mr. Jeffreys, is *Trophon clathratus,* a characteristic fossil of all glacial and post-glacial beds.]

[**Fusus decussatus** of Brown (Illust. Conch. G. B.) is said to have been discovered by him at Killough, Co. Down. The figures and description are

* Since above went to press, the writer has dredged it alive in 3 fathoms off Rockport, Belfast Lough.

not sufficient for identification. Jeffreys suggests that it may have been a plain-coloured variety of *Trophon Syracusanus*, which is a rather common Mediterranean shell.]

Fusus antiquus, *Linné.*

Living commonly around the coast, ranging in depth from between tide-marks in Belfast Lough to 100 fathoms at the Maiden Rocks. Called "buckie" along with *Buccinum undatum*. Specimens of great size from Carrickfergus are in the Belfast Museum Collection. A curious convoluted monstrosity is mentioned by Hyndman as dredged off Groomsport by Mr. Samuel Vance.

var. **alba.** Carrickfergus—Belf. Mus. Coll.

Fusus gracilis, *Da Costa.*

Frequent, but not so generally distributed as the last. Hyndman dredged it alive in 60 to 90 fathoms off the Maidens (*F. Islandicus*). Jeffreys gives its range as 20 to 145 fathoms, but it frequents less depths in our district, as it has been dredged living in abundance in 6-8 fathoms off Bangor by Mr. S. A. Stewart, and is sometimes thrown ashore in quantity, with the animal quite fresh, between Holywood and Craigavad, where the greatest depth of water in the vicinity does not exceed 4 or 5 fathoms, and the writer has noticed it living between tide-marks at Cultra. It did not occur to Dickie in Strangford Lough, nor have I observed it on the Derry coast. It is *F. corneus* of Thompson's work.

Nassa reticulata, *Linné.*

Would appear to be somewhat local. Occasionally found living about Belfast Lough, in 10 to 20 fathoms; dead on the Turbot Bank—Hyndman. Living between tide-marks at Cultra—R.Ll.P. Not recorded from Strangford Lough. I have dead shells from Portrush and Magilligan.

Nassa incrassata, *Ström.*

Abundant throughout the province, living in from 7 to 90 fathoms. *N. macula* of Thompson's work.

Nassa pygmæa, *Lamarck.*

Very rare. In Hyndman's 1858 Report it is noted as having been taken alive by Mr. Waller on the Turbot Bank; in the previous Report it had been recorded with doubt from the same vicinity, by Dr. Dickie, but only in a dead state. It is a common shell in our Estuarine Clays, where *N. incrassata* is unknown.

[**Nassa hepatica,** *Montagu.*

Recorded from Strangford Lough, on the authority of Turton and Brown (*Monoceros hepaticus*). It is a West Indian shell.]

[**Columbella Holbolii.**

Appears in Hyndman's Reports for 1857 and 1858 (*sub Mangelia Holbolii* and *Buccinum Holbolii*) as dredged on the Turbot Bank. It is an inhabitant of the arctic seas, and occurs in Britain only as a glacial fossil.]

Defrancia teres, *Forbes.*

Fragments of this shell were dredged by Hyndman on the Turbot Bank.

Defrancia Leufroyi, *Michaud.*

Dead, but very fresh, in Turbot Bank sand, and a single broken example in 40 fathoms off the Copelands—Hyndman (*Mangelia Leufroyi*).

Defrancia linearis, *Montagu.*

"Generally distributed"—Thompson (*Pleurotoma linearis*). Frequent on the Turbot Bank—Hyndman; rare in Strangford Lough and the channel adjoining—Dickie; in all instances dead (*sub Mangelia linearis*).

Defrancia reticulata, *Renier.*

"A single dead specimen of this rare and beautiful shell was found by Mr. Jeffreys in dredging from the deep water north of the Maidens. New to the Irish list. It is a southern form"—Hyndman, 1859 Report (*sub Mangelia reticulata*). As *Mangelia scabra*, it is recorded in Hyndman's 1858 Report as found by Mr. Jeffreys in Turbot Bank sand.

Defrancia purpurea, *Montagu.*

"Of general occurrence"—Thompson (*Pleurotoma purpurea*). "Rare, in shell sand"—Hyndman (*Mangelia purpurea*). Very rare, in 12-25 fathoms off the entrance to Strangford Lough—Dickie. Bangor—Belf. Mus. Coll. Shell sand on beach at Cultra—R.Ll.P.

Pleurotoma striolata, (*Scacchi*) *Philippi.*

Turbot Bank sand—Hyndman (*Mangelia striolata*).

Pleurotoma attenuata, *Montagu.*

"General, but not abundant"—Thompson. "Dead, Turbot Bank sand, Mr. Waller"—Hyndman (*Mangelia attenuata*). Very rare, dead, in 18-20 fathoms 4 to 5 miles from Strangford Bar—Dickie. Bundoran—Belf. Mus. Coll.

Pleurotoma costata, *Donovan.*

Dead, rare, in 10 fathoms, and not unfrequent on the Turbot Bank—Hyndman (*Mangelia costata*). Dickie dredged dead shells off the entrance to Strangford Lough, 12-15 fathoms. The variety *coarctata*, mentioned by Hyndman as obtained near the Turbot Bank, is merely the northern and larger form of the species.

Pleurotoma brachystoma, *Philippi.*

"Co. Antrim (Waller)"—Jeffreys; this is all the information we possess about the occurrence of this shell in the district.

Pleurotoma nebula, *Montagu.*

Dead, rare, in shell sand dredged on the Turbot Bank—Hyndman (*Mangelia nebula*).

Pleurotoma septangularis, *Montagu.*

"Generally distributed"—Thompson. Living, rare, in 10 fathoms in Belfast Lough, and dead on the Turbot Bank—Hyndman; and Dickie found a few living examples in Castle Ward Bay, Strangford Lough, 7-20 fathoms (both *sub Mangelia septangularis*). Bangor—Belf. Mus. Coll.

Pleurotoma rufa, *Montagu.*

Living, rare, off Groomsport (Waller), and dead on the Turbot Bank—Hyndman (*Mangelia rufa*). Dead shells in Strangford Lough—Thompson, Dickie, and R.Ll.P.; and in the channel outside—Dickie.

var. **lactea.** "A small form of this pretty variety, mostly having the upper part of the spire tinged with purplish-brown, was procured by Mr. Hyndman from Port Ballantrae, Co. Antrim"—Jeffreys.

var. **Ulideana.** "Round the Irish coasts, but rare"—Thompson (*sub P. Ulideana*).

Pleurotoma turricula, *Montagu.*

"Of general occurrence"—Thompson. Living in 25 fathoms off Black Head; dead, rare, on the Turbot Bank, and off Ballygalley Head, and frequent in 5-6 fathoms in Belfast Lough—Hyndman. Dead, rare, in Strangford Lough—Dickie (*Mangelia turricula*). Bangor—Belf. Mus. Coll. Crawfordsburn, dead—Mr. Swanston. Cultra, dead—R.Ll.P.

[**Pleurotoma Trevelyana,** *Turton.*

Dredged in 25 and 27 fathoms in the neighbourhood of the Turbot Bank—Hyndman (*Mangelia Trevelliana*). Jeffreys considers that the specimens there obtained were glacial fossils. The species is entirely northern.]

Marginella lævis, *Donovan.*

"Magilligan, Co. Londonderry, G. C. Hyndman"—Thompson (*sub Erato lævis*).

Cypræa Europæa, *Montagu.*

Generally diffused throughout our waters, living in from about 0 to 20 fathoms. In a dead state it is thrown up on most sandy beaches, and was dredged in up to 100 fathoms depth near the Maidens. The pretty and well-known shells of this, the only British cowry, are locally called "Johnny-grots," which is a corruption of the Scotch name of "John-o'-Groat's buckie." *Bulla diaphana*, recorded by Thompson as taken in Strangford Lough, is the young of the present species before the outer lip is formed.

[**Cypræa moneta.**

"Specimens of this shell have been frequently found on the shore near Bangor, Co. Down. Although not indigenous, its occurrence may be worth noticing, as there is a tradition that a ship engaged in the slave trade was wrecked there, and thus the cowries are accounted for"—Hyndman. It is the money-cowry of South Africa.]

Ovula patula, *Pennant.*

"A shell of this species, found some years ago on the sandy beach of Magilligan, County of Londonderry, by Mrs. R. A. Hyndman, of Dublin, is in the cabinet of Mr. Hyndman, at Belfast"—Thompson. A single dead specimen dredged by Mr. Waller on the Turbot Bank—Hyndman. These are the only notes of the occurrence of this curious shell in the North of Ireland. The Magilligan specimen is in the Belfast Museum.

ORDER PLEUROBRANCHIATA.

Cylichna acuminata, *Bruguière.*

Mr. Waller obtained a single dead shell of this species on the Turbot Bank, and Hyndman another. These are recorded in Hyndman's Reports, under the name *Ovula acuminata.*

Cylichna umbilicata, *Montagu.*

Very rare; dead shells in Turbot Bank sand—Hyndman.

Cylichna cylindracea, *Pennant.*

"Generally distributed"—Thompson (*sub Bulla cylindracea*). Dredged, in a dead state, on the Turbot Bank, and off Ballygalley Head, by Hyndman, and in Castle Ward Bay, Strangford Lough, by Dickie. Bundoran—Belf. Mus. Coll.

[**Cylichna striata** (*Bulla striata*, Brown).

"The late Mr. Thompson of Belfast erroneously noticed this arctic species as found at Bangor, Co. Down, by Mr. Hyndman. It inhabits the eastern coasts of North America, Greenland, and Finmark"—Jeffreys.]

Utriculus mammillatus, *Philippi.*

Turbot Bank, dead, Mr. Waller—Hyndman (*Cylichna mammillata*).

Utriculus truncatulus, *Bruguière.*

"Generally distributed"—Thompson (*Bulla truncata*). Hyndman occasionally dredged dead shells on the Turbot Bank (*Cylichna truncata*), but does not record having taken it elsewhere. Magilligan—Belf. Mus. Coll. Twin Islands in Belfast Harbour—Mr. Swanston.

Utriculus obtusus, *Montagu.*

"Generally distributed"—Thompson (*Bulla obtusa*). Hyndman notes it (*sub Cylichna obtusa*) from the Turbot Bank several times, and from off Ballygalley Head, in a dead state. Dead shells dredged in Strangford Lough—Dickie, and R.Ll.P. It frequents muddy estuaries chiefly.

var. **Lajonkaireana.** "From the Turbot Bank, dead; determined by Mr. Jeffreys, in Mr. Hyndman's cabinet"—Hyndman, 1859 Report (*sub Cylichna Lajonkaireana*).

Utriculus hyalinus, *Turton.*

"Obtained in shell sand collected at Bundoran by Mrs. Hancock"—Thompson (*sub Bulla hyalina*). "Dead, in 80 fathoms, off the Maidens"—Hyndman (*sub Amphisphyra hyalina*).

Acera bullata, *Müller.*

Generally distributed—Thompson (*sub Bulla Akera*). It abounds on the *Zostera* banks of Strangford, Belfast, and Larne Loughs, and in Lough Foyle. Hyndman says he has sometimes seen it swimming in the channel leading to the Quays at Belfast, giving out a purple liquid when touched.

var. **nana.** "Occurs in Larne Lough"—Jeffreys.

Actæon tornatilis, *Linné.*

Generally distributed—Thompson. Dead, rare, off Bangor, and on the Turbot Bank—Hyndman. Dead, rare, in Castle Ward Bay, Strangford Lough—Dickie. (*Sub Tornatella fasciata* by all.) Groomsport—Mr. Swanston. Dead, rare, 8-10 fathoms, Belfast Bay—Mr. S. A. Stewart. Port Stewart—Miss Richardson. Frequent on the Derry coast, thrown up by the tide, from the Bann to Magilligan Point—R.Ll.P. It is a most elegant shell. Rev. Canon Grainger informs me that at Magilligan it is locally known as "beer-barrel."

Bulla utriculus, *Brocchi.*

"Living, very rare. A single specimen from Groomsport many years ago; none since"—Hyndman; and in his first list of Turbot Bank shells he notes "a single dead specimen each to Dr. Dickie and G. C. H." (*sub B. Cranchii*).

Scaphander lignarius, *Linné.*

"Generally distributed"—Thompson (*sub Bulla Lignaria*). "Not uncommon, of large size, off Groomsport, living, in 6 or 8 fathoms, and in other places"—Hyndman; and he dredged dead shells in depths up to 100 fathoms. Living in abundance, and of large size, in 6 to 8 fathoms off Bangor, and from thence to Crawfordsburn—Mr. Swanston, and Mr. S. A. Stewart. Fine living examples dredged in 2 fathoms off Cultra, and it is occasionally thrown up by the tide between Holywood and Craigavad in quantity, with the animal fresh—R.Ll.P. Jeffreys states that it usually frequents the coral-line zone (15-50 fathoms); the above notes show that in our district it inhabits shallower water. Dead shells at Portrush and Magilligan—R.Ll.P.

var. **alba.** Bangor—Belf. Mus. Coll.

Philine scabra, *Müller.*

"Has been found at Bundoran (Co. Donegal), by Mrs. Hancock"—Thompson (*sub Bulla pectinata*). Rare, dead, on the Turbot Bank—Hyndman.

Philine catena, *Montagu.*

"Bundoran, Co. Donegal (J.G.J.)"—Jeffreys. Specimens from the same station are in Thompson's collection in the Belfast Museum.

Philine angulata, *Jeffreys.*

"Larne, Co. Antrim (J.G.J.)"—Jeffreys.

Philine quadrata, *Searles Wood.*

"Dead, in 80 fathoms off the Maidens"—Hyndman, 1859 Report.

Philine punctata, *Clark.*

Bundoran in Co. Donegal, where it has been obtained by Mrs. Hancock (*fide* Thompson, *sub Bullæa punctata*), and Jeffreys.

Philine aperta, *Linné.*

"Generally distributed"—Thompson (*Bullæa aperta*). A rather common species, living in sand and mud at a few fathoms depth. "Living, common,

6-8 fathoms off Bangor"—Mr. S. A. Stewart. Of large size on the Holywood Banks—Mr. Swanston. Dead shells on Magilligan strand—R.Ll.P.

Aplysia punctata, *Cuvier.*

"Living, rather scarce, in 8 or 10 fathoms, off Bangor and Groomsport, and in Castle Chichester Bay"—Hyndman (*sub A. hybrida*). *A. nexa* of Thompson is the young of this species.

Pleurobranchus membranaceus, *Montagu.*

"Living, scarce, off Groomsport, in 6 or 8 fathoms, and in other places"—Hyndman.

INDEX.

Names of shells which are not admitted as native, owing to their being importations, mistakes, or fossils, or which appear in the foregoing list only as synonyms, are printed, in the case of *genera*, in parenthesis, and in the case of *species*, in italics.

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LEPIDOPTERA

TAKEN IN THE BELFAST DISTRICT.

By CHARLES W. WATTS, F.I.C.

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INTRODUCTION.

[*Read 20th February, 1894.*]

The entomologist living in Belfast has within his reach many places where he can capture his game. For short excursions, the range of hills from the Knockagh to the White Mountain is probably the best ground, including, as it does, wooded glens such as Collin Glen, the chalky slopes of the eastern faces, and the moorland and bogs of the higher parts of the hills. Each of these has its characteristic flora, and, feeding on the plants, we may expect an insect-fauna to correspond.

Nearer home than the hills are productive spots like the marshes by the Lagan, and the Bog Meadows, and the lanes and hedgerows produce plenty of common insects, besides some better species among the Micro-lepidoptera.

Further afield, but still within a day's excursion, are Islandmagee and the coast just north of Larne, and on the Co. Down side, the shore and the numerous plantations, especially the woods about Helen's Tower.

Inland in both counties we cannot expect great results. The country is more or less cultivated, and on such ground only the commonest species occur, but these sometimes swarm in particular places.

Of the more distant localities within the district the Mourne Mountains are undoubtedly the best, and after them, the Glens of Antrim, particularly Glenarm, and the sandhills of Portrush,

Ballycastle, and Dundrum. I have no experience of the Antrim hills north of Larne, but they are so similar to the Belfast hills that their fauna is probably very much the same.

I will now proceed to describe some of these localities more particularly, and mention some of the insects that occur in each. It will, of course, be understood that I do not imply that these are the only, or the best places for collecting, but that they are the places with which I happen to be familiar, either because they were convenient to the part of the town where I lived, or because they were favourite places for holiday-making.

About a quarter of a mile north of the second lock on the Lagan there are some low-lying marshy fields. To the N. and E. the ground rises pretty steeply, and in the N.E. corner is a pond. Along the side of the slope is a disused water-course, which formerly, I believe, supplied the town. It is now filled with water-plants, *Sparganium*, *Iris*, and various reeds and grasses. When in flower in June and July these reeds attract numbers of *Noctuæ*, the larvæ of which feed on the leaves in the autumn and spring. The most abundant species are *Leucania pallens*, *impura*, *comma* and *lithargyria*; *Tapinostola fulva*, *Noctua umbrosa*, *baja*, *c-nigrum*, *festiva*, *rubi*, and *xanthographa*, *Apamea leucostigma* and *didyma*, the last in great numbers and infinite variety of colour and markings.

Earlier in the season several species of the genus *Tœniocampa* may be found feeding at the blossom of the willow at night. Flying over nettles and flowers in the summer, we may net *Plusia pulchrina*, *chrysitis* and *festucæ*, *Dianthœcia nana* and *capsincola*, whose larvæ feed in the seed capsules of *Silene* and *Lychnis*. To capture these *Noctuæ* in the summer months, the collector must keep late hours, for they do not settle down to feed till it is really dark, and in these latitudes that is not before half-past ten. From this time until midnight they can be taken off grass and reed flowers by the simple process of enclosing them in a chip-box after examining by the light of a lantern to see whether they are worth taking. They seldom attempt to fly; at the most, they sometimes drop to the ground or into

the water, as the case may be, for the grasses actually growing in the old water-course are by far the most attractive. The collector must be prepared to get his feet wet, or lose most of his moths. The only scarce Geometer that occurs in the marshes is *Phibalapteryx vittata*. The larva of this moth feeds on *Galium palustre*, and the moth is extremely abundant in June, both in these marshes and in the Bog Meadows. It is usually a scarce species in Ireland, so that it may fairly be claimed as a local speciality.

Along the rough hedge at the top of the hill we may capture a number of species, mostly common, but *Emmelesia decolorata* is a good thing, which is abundant here. Only the commonest butterflies can be expected in such a locality, and it is hardly worth visiting in the day-time, except for Micro-lepidoptera, of which a number of common species occur. On the banks of the river I have found the curious larva of the *Chœrocampa elpenor* (Elephant Hawk) feeding on *Epilobium hirsutum*, and the larva of *Smerinthus populi* is common on the willows. *Epione apiciaria* also feeds on the willows along the river, and the moth, which is scarce in Ireland, may be netted while flying at dusk in August. *Cataclysta lemnata* feeds on *Lemna* in the pond and ditches, and *Hydrocampa stagnata* on *Potamogeton* in the pond. Several species of the genus *Scopula* are common, and a number of *Tortrices* and *Tineæ*, but nothing rare has turned up here. Altogether, I have taken 103 species of butterflies and the large moths in this one field, besides Micro-lepidoptera.

Collin Glen is one of the best collecting grounds in the immediate neighbourhood of Belfast. It is at its best in May and June. Later in the year the vegetation gets so rank that it is difficult to collect in the upper glen, which is the best part. The fauna of the upper and lower glens differs considerably, as might be expected from the different character of the ground. In the lower glen the trees are larger and the ground more open, but on the whole the results of collecting, either by day or night, are disappointing. I have tried here the well-known

method of spreading what is called "sugar" on the trees to attract *Noctuæ*, but it has never proved a success. Indeed, the same may be said of every place that I have tried, except the Donard demesne at Newcastle. The cause is probably the dampness of the majority of the otherwise suitable localities, including most of the wooded glens in the district. Two of the less universal butterflies occur here, namely, *Pararge egeria* (Wood Argus) and *Epinephele hyperanthus* (Ringlet), the former being very common. *Euchloë cardamines* (Orange-tip) is also common in the glen, and still more so on the mountain just above, where I have taken specimens of a dwarf race. *Macroglossa bombyliformis* is common at the top of the glen; the larva feeds on *Scabiosa succisa*, and the moth is fond of the flowers of *Pedicularis*. Of the *Bombyces*, *Spilosoma fuliginosa* is common, also *Lophopteryx camelina* and *Thyatira derasa* and *batis*. The *Noctuæ* include *Miana arcuosa*, *Grammesia trigrammica*, *Dianthœcia nana*, and *Plusia pulchrina*, and of the *Geometræ*, which are more abundant, the commonest are *Metrocampa margaritaria* (Light Emerald), *Selenia bilunaria*, *Odontopera bidentata*, *Cabera pusaria* and *exanthemaria*, which fly in swarms about dusk, *Strenia clathrata*, *Eupithecia lariciata* among the larches in the higher parts, *Hypsipetes impluviata* among alder, *Melanthia bicolorata* and *ocellata*, *Anticlea badiata* and *nigrofasciaria* and *Cidaria silaceata*, of which the larva feeds on the enchanter's nightshade.

We are on very different ground when we come to explore the hills, and we meet with an entirely different insect fauna. Species which are universal on the lower ground are entirely absent on the heather, and naturally the heath-feeding species do not occur away from the food-plant. Besides the heath species there are several which feed on *Vaccinium*, on various low plants, on ferns and grasses, and on *Salix repens*. The last is comparatively scarce on most parts of the Belfast hills, so that the fauna is poorer than it would be if this favourite food-plant were more abundant. On the steep eastern face of the hills many plants grow which are not to be found off the Chalk,

and this peculiar flora results in a peculiar fauna, many species, particularly among the micros, occurring here, and nowhere else in the district except on similar ground along the Antrim coast.

There are no butterflies peculiar to the hills, but *Lycœna icarus* (Common Blue) and *Polyommatus phlœas* (Copper) are common on the Chalk. *Cœnonympha pamphilus* is to be found all over the hills, and *Euchloë cardamines* wherever *Cardamine pratensis* grows.

Of *Sphinges*, *Macroglossa bombyliformis* is common, and *Zygœna filipendulæ* on the east of Black Hill.

Of the *Bombyces*, *Nemeophila plantaginis* is rather scarce, but *Saturnia pavonia* (Emperor) is common. The larvæ of this moth, and of *Bombyx rubi* are to be found feeding on heath in the autumn, and the curious cocoon of the Emperor is a familiar object in winter.

Several good *Noctuæ* occur, and *Celœna Haworthii*, *Stilbia anomala*, *Noctua glareosa* and *festiva*, *Agrotis strigula*, and *Hadena glauca* and *adusta* are all fairly common. Some good varieties of commoner species also occur on the higher ground, *Triphœna comes* and *Noctua xanthographa* being especially remarkable. Of the *Geometræ* may be mentioned *Ematurga atomaria*, *Oparabia filigrammaria*, *Larentia cæsiata* and *salicata*, *Eupithecia satyrata*, var. *callunaria*, *E. nanata*, *Phibalapteryx lapidata* in marshy places, *Cidaria populata*, *C. testata*, and *Anaitis plagiata* among *Hypericum* on the east side of Black Mountain.

Two species of Plume moths are common on Black Hill, viz., *Mimesioptilus bipunctidactylus* and *pterodactylus*, and last autumn I took a specimen of the very rare *Platyptilia isodactyla* on marshy ground between Divis and Black Hill, where its food-plant grows abundantly.

A number of characteristic *Tortrices* occur, principally among heather. Of these the following are worth mention :— *Tortrix viburnana*, *T. palleana*, *Peronea caledoniana*, *Mixodia Schulziana*, *Catoptria hypericana*, *Eupœcilia ciliella*, *Argyrolepia Hartmanniana* and *Xanthosetia zœgana*.

The Knockagh near Carrickfergus is of a similar character, but there are several insects to be found there which do not seem to occur either on the Belfast hills or on Islandmagee. *Lycœna minima* (Little Blue) occurs about the top of the cliff, this being also the favourite ground for several good species, such as *Melanippe tristata*, *Nemeophilia plantaginis*, *Ennychia cingulata*, *Oxyptilus parvidactylus*, and *Scoparia ingratella*, most of which seem peculiar to this hill, at least so far as our district is concerned.

The cliffs and slopes of Islandmagee between Black Head and Gobbin Head are very productive. The morning is the best time here, for in the afternoon the sun soon gets behind the hill and the temperature falls rapidly. Of the night-flying insects I know nothing, as the locality is too far for walking back after work, and there is no late train to town.

Lycœna minima is exceedingly abundant here in June, and may be seen wherever *Anthyllis vulneraria* grows. The tiny larva feeds in the woolly flower-heads of this plant, but is very difficult to find. *Lycœna icarus* is common, also *Pararge megœra*, *Vanessa urticœ*, *atalanta*, and *cardui*.

Nemeophila plantaginis is commoner here than anywhere else in the district and in some years is exceedingly abundant. *Spilosoma fuliginosa* occurs, and the larvæ of *Bombyx quercus*, var. *callunœ* may be collected in June, feeding on bramble.

Of the other families of Lepidoptera may be mentioned *Strenia clathrata*, *Emmelesia albulata*, and *Eupithecia constrictata* among the *Geometrœ*; *Scopula ferrugalis*, *Aciptilia tetradactyla*, *Homeosoma senecionis*, and *Phycis subornatella* among the *Pyralides*; and *Peronea Schalleriana*, *Penthina gentiana*, *Sericoris littoralis*, and *Conchylis straminea* among the *Tortrices*.

Plutella cruciferarum (the Diamond-back Moth), which has sometimes completely destroyed the crops of turnips and other cruciferous plants in England, is fairly common here, but I have never seen any sign of damage, so it may be hoped that the climate is unfavourable to its multiplication.

Glyphipteryx equitella and *Fischeriella*, tiny black and silver species, are to be found on grass, flying about 4 P.M. in the sunshine; several species of *Argyresthesia* and *Elachista* are also to be found. In all probability much the same species occur at many similar spots along the Antrim coast, and a number of species are recorded from Glenarm, but these places are beyond a single day's excursion. At Glenariffe I have taken *Larentia olivata*, which is rare in Ireland, and no doubt the locality would repay investigation, though it is not well suited for night work.

On the north coast of Antrim, the sandhills of Ballycastle and Portrush are splendid collecting grounds for those species that frequent such places. At Ballycastle the very local *Nyssia zonaria* is plentiful at the beginning of April. So far this species is only recorded, in Ireland, from Ballycastle and Achill Island. It occurs also in the Isle of Man and on the coasts of Cheshire and North Wales.

I now come to the districts in County Down, and shall confine my remarks to the Mourne Mountains, and more particularly to the immediate neighbourhood of Newcastle, which is the best centre for collecting.

To the west of Newcastle there is a fine stretch of sandhills stretching to Dundrum Bay; at the back of the village are the woods of Donard demesne, perhaps the best woods in our district, and beyond the woods are the mountains. Each of these produces its special insects, which, for the most part, are not to be found in the others. The best part of the sandhills begins about two miles from Newcastle and extends to Dundrum Bay; they are continued on the opposite side of the bay, but this part is too distant for convenient working.

Two butterflies are abundant all over the sandhills, *Lycœna icarus* and *Satyrus semele* (Grayling). The western Irish forms of both differ considerably from the English and European types, being in both cases larger and more brightly coloured. In the south of England the male *icarus* is small and of a rather dull lilac-blue, and the female is brown, slightly tinged with

blue, and with a border of red spots round all the wings. In this district the male is large and very bright blue, approaching the colour of *Lycœna adonis*, while the female is also blue, though not so bright, and the marginal red spots are very large and bright. Specimens of both forms may be seen in the Museum collection.

There is not much to be got on sandhills early in the year; the real work begins with the flowering of the marram grass in June and July, and is better still when the ragweed is in flower in August. Great numbers of *Agrotidæ* and other *Noctuæ* frequent these flowers. A few come out about 4 P.M. on sunny days, and are then easily collected; but for one that is out then a hundred are out after dark.

The heads of the *Senecio* are sometimes very large in such situations, and on a single flower-head I have counted fifty or sixty moths at once; but they are very particular in their choice, and while one flower-head is nearly covered with moths, neighbouring and, as far as we can see, exactly similar heads are nearly deserted. Besides the moths there are plenty of earwigs, beetles, and gnats for any that are interested in these orders of insects. A few species are particularly abundant, viz.:—*Apamea didyma* in infinite variety, *Agrotis tritici* and *Noctua xanthographa*, also very variable. Five out of six moths belong to one or other of these species, but several others are also common—*Miana strigilis*, *M. bicoloria*, *M. literosa*, *Agrotis vestigialis*, *A. cursoria*, *A. nigricans*, *A. præcox*, *A. lucernea*, and *A. suffusa*; *Noctua rubi*, *Triphœna ianthina*, and the common yellow underwings; *Phlogophora meticulosa*, *Hydræcia lucens*, *H. micacea*, and a number of others. A few *Geometræ* come also to the flowers, besides a good many *Crambi* and other *Pyralides*, and several species of *Depressaria*. On the heather and bracken of the older parts of the sandhills other species occur, but the only noticeable one is *Gnophos obscurata*, which is very abundant.

Micro-lepidoptera are abundant, and several good species occur, such as *Anerastia lotella*, *Crambus Warringtonellus*, *C.*

geniculeus, *Dictyopteryx Bergmanniana* amongst *Rosa spinosissima*, and many small *Gelechidæ*, which can be obtained by kicking them out of the roots of the bent, where they shelter during the day-time.

Insects are abundant in the woods of Donard demesne throughout the season. *Lycœna argiolus* (Holly Blue) is out in May and *Argynnis paphia* (Silver-washed Fritillary) in July, but the latter is scarce. No *Sphinges* seem to occur, and not many *Bombyces*, but *Hylophila prasinana* is common, also *Hepialus velleda*, *H. hectus*, and *Thyatira batis*. The latter comes to sugar along with various *Noctuæ*, such as *Acronycta rumicis*, *Hadena adusta*, and *Caradrina taraxaci*, and *Aphomia sociella*, whose larva feeds on the wax in bee-hives and the nests of wild bees.

The *Geometræ* are well represented, including several uncommon species, especially among the fir-feeding kinds. *Ellopia prosapiaria* is common, also *Bupalus piniaria* and *Boarmia repandata*, and the fine banded variety *conversaria*. *Venusia cambrica* and *Emmelesia teniata* are scarce. Several *Eupithecia* occur, including *E. satyrata*, *castigata*, *lariciata*, and *pumilata*. The last feeds on the flowers of *Ulex*, and swarms both in the higher parts of the demense and in the lower valleys. The pretty *Melanthia albicillata* may be seen settled on tree trunks in July. *Thera variata* is very abundant, but *T. firmata* is scarce. Micros are not very abundant, and only *Amblyptilia acanthodactyla* and *Olindia ulmana* are worth noting.

Collecting on the mountains themselves is rather disappointing, especially in the number of specimens obtained. I have sometimes walked several miles without seeing a specimen of any sort, and this on a fine day in summer. Nevertheless, a good many species occur, and I believe that a resident collector could do very good work when he had once found the right spots for insects.

This paucity of insects no doubt is due to the poverty of the flora of the Mourne range. There are no truly alpine insects recorded from the district, but then only Slieve Donard rises

appreciably over 2,400 feet, which is the lowest limit of alpine insects, and the upper part of this mountain is too bare and shelterless for Lepidoptera to exist there.

The most promising-looking parts for such insects are the actual tops of the few mountains which are crowned with rocks, like Bingian, Bearnagh, and Commedagh. Round these rocks the vegetation is luxuriant, and *Salix herbacea* grows freely. A few species occurring lower down may be mentioned. *Saturnia pavonia* is common, and its larva, together with that of *Dicranura vinula* and *Pygœra pigra*, is common on willow bushes by the streams. *Hadena contigua* occurs, *Anarta myrtilli* is common, also *Stilbia anomola*, *Pachnobia rubricosa* and *Phytometra viridaria*. The *Geometræ* include *Gnophos obscurata*, *Pseudoterpna pruinata*, *Scodiona belgiaria*, *Larentia cœsiata*, *Eupithecia nanata*, *E. minutata* and *E. sobrinata*—this last feeding on juniper. A few micros may be mentioned:—*Phycis fusca* occurs in the Happy Valley and also above Donard demesne, *Mixodia Schulziana* is pretty common, and *Pamplusia mercuriana* occurs at the top of Slieve Bingian.

No doubt further search would result in many additions to this rather meagre list, but there is so large an extent of country to be covered that for anyone living at a distance it would take many years to make anything approaching a complete list of the lepidoptera of the Mournes.

In conclusion, I may say that specimens of nearly all the species mentioned are now in the Belfast Museum collection, and that it is much to be hoped that some member of the Club will take up this branch of field work and add to our knowledge of our local Lepidoptera.

LIST OF SPECIES.

RHOPALOCERA.

Pieris brassicæ—Common.
rapæ—Common.
napi—Common. Occurs in the marshes on the Belfast hills up to 900 feet. The specimens are generally strongly marked on upper side, and the under side is sometimes very yellow.
Euchloë cardamines—Common. I have specimens from the Belfast hills expanding only 30 mm.
Argynnis paphia—Donard demesne and other woods, but not common.
Vanessa urticæ—Common.
atalanta—Not common generally, but very abundant in 1893.
cardui—Common in some years.
Pararge egeria—Very abundant in all woods and lanes, from May to October.
megæra—Local; Islandmagee, Newcastle, &c.
Satyrus semele—Very abundant on sandhills, Newcastle, &c.; the specimens are large and brightly coloured.
Epinephele janira—Common. Large and well marked; females, with *bipupilled ocellus* and extra *ocelli*, sometimes occur.
hyperanthus—Common.
Cœnonympha pamphilus—Common.
Polyommatus phlæas—Common.
Lycæna icarus—Common. Large; males often very bright blue; females also very blue, with the marginal red spots strongly developed, and occasionally the discoidal spots on both wings are white-ringed.
argiolus—Donard demesne; common.
minima—Antrim coast. Very abundant on Islandmagee; male often bluer than type, and some times showing the discoidal spots as in *L. argiolus*.

[None of the *Hesperidæ* are recorded from this district.]

SPHINGES.

Acherontia atropos—Lisburn, &c.; scarce.
Deiliphila livornica—Two specimens taken at rhododendron flowers in Ormeau Park, Belfast, June, 1888.
Chærocampa elpenor—Larvæ occasionally on *Epilobium hirsutum* about Belfast.
Smerinthus populi—Common.
Macroglossa stellatarum—Scarce.
bombyliformis—Common on Belfast hills.
Zygæna filipendulæ—Common.

BOMBYCES.

Hylophila prasinana—Common.
Nudaria mundana—Newcastle, &c.; scarce.
Euchelia jacobææ—Common.
Nemeophila plantaginis—Islandmagee, very abundant; Belfast hills.
Arctia caja—Common.

Spilosoma fuliginosa—Common.
mendica — Common ; males apparently always cream-coloured.
lubricipeda – Common.
menthastri — Very abundant ; some specimens nearly immaculate, and ochreous specimens (var. *ochracea*) are common, sometimes with the wing-rays white.
Hepialus humuli—Very abundant.
velleda — Very abundant ; var. *gallicus* also common.
hectus—Common.
Orgyia antiqua—Larvæ scarce.
Bombyx rubi—Larvæ common on hills.
quercus, var. **callunæ**—Larvæ common.
Saturnia pavonia—Very common on hills.
Dicranura vinula—Common.
Lophopteryx camelina—Common.
Notodonta dictæa—Scarce.
dromedarius—Scarce, Belfast.
ziczac- Larvæ not uncommon on Willow.
Phalæra bucephala—Common.
Pygæra pigra—Larvæ on willow, Mourne Mountains.
Thyatira derasa — Collin Glen ; common.
batis—Very common.

NOCTUÆ.

Bryophila perla—Newcastle.
Aconycta psi– Common.
rumicis — Donard demesne ; a pale form.
Leucania conigera—Belfast marshes.
lithargyria—Common.
comma—Common.
impura—Very abundant.
pallens — Very abundant ; var. *rufescens* common.
Tapinostola fulva — Very abundant in marshes near Belfast ; varies from pale bone-colour to dark reddish.
Nonagria arundinis—Local in Co. Down.
Hydræcia nictitans—Most, if not all, the specimens from this district are referable to *H. lucens*.
micacea—Common.
Xylophasia rurea — Very abundant ; var *combusta* also common.
lithoxylea—Very abundant.
monoglypha — Very abundant ; var. *brunnea* (Tutt) is common and var. *obscura* (Tutt) scarce.
Neuronia popularis—Belfast.
Charæas graminis — Very abundant.
Luperina testacea—Belfast; common.
Mamestra brassicæ—Common.
Apamea basilinea—Common.
Apamea ophiogramma — One specimen in a marsh near Belfast.
gemina—Common.
leucostigma—The type and var. *fibrosa* are both common in the marshes about Belfast and elsewhere in the district.
didyma—Very abundant.
Miana strigilis—The type is scarce, but the darker varieties fairly common.
fasciuncula — Common ; small grey specimens occur on the hills in August.
literosa—Not common, but generally distributed.
bicoloria—Very abundant ; var. *rufuncula* is not uncommon.
Celæna Haworthii—Common on Belfast hills.
Grammesia trigrammica—Common.
Stilbia anomola—Common in one place on Black Mountain, Belfast ; also occurs in the Mourne Mountains The specimens are large and dark.
Caradrina taraxaci—Common.
4-punctata—Very abundant ; the specimens from this district are generally either ochreous or dark grey.
Rusina tenebrosa—Belfast scarce.

Agrotis vestigialis — Sand-hills, Dundrum; abundant.
segetum—Common.
exclamationis—Common.
cursoria—Sand-hills; common.
nigricans—Common.
tritici—Sand-hills; very abundant; mostly reddish brown.
strigula—Belfast hills, abundant.
præcox—Sand-hills, common.
lucernea—Sand-hills at Dundrum; dark grey.
Noctua glareosa — Belfast hills, abundant.
augur—Common.
plecta—Common.
c-nigrum—Common.
brunnea—Common.
festiva—Common.
umbrosa—Very abundant.
rubi—Common.
baja—Common.
Triphæna ianthina—Common.
comes—Common.
pronuba—Common.
Amphipyra tragopogonis—Common.
Mania typica—Common.
maura—Common.
Tæniocampa gothica — Very abundant at willows in spring.
incerta—Very abundant, but not very variable, most of the specimens being dark brown.
opima — Belfast; both the pale type and var. *brunnea* (Tutt).
stabilis—Very abundant.
Orthosia lota—Belfast, common.
Cerastis vaccinii—Common at ivy-bloom.
spadicea—Common at ivy-bloom.
Scopelosoma satellitia — Common at ivy-bloom.
Xanthia fulvago—Belfast, scarce.
circellaris—Belfast, scarce.
Cirrhædia xerampelina—Belfast and Castlewellan.
Calymnia trapezina—Common.
Dianthæcia nana — Common in marshes.
capsincola—Common.
cucubali—Common.
Polia chi—Glenarm.
Miselia oxyacanthæ—Common.
Agriopis aprilina—Common.
Euplexia lucipara—Common.
Aplecta nebulosa—Common.
Hadena adusta—Donard demesne and Black Mountain; common.
glauca — Belfast hills, common. The specimens belong to var. *lappo* (Dup.)
dentina—Common.
trifolii—Common.
oleracea—Common.
pisi—Scarce.
contigua — Mourne Mountains, scarce.
Calocampa exoleta—Belfast, &c.; common.
vetusta—Belfast, &c; common.
Cucullia umbratica—Donard demesne, scarce.
Gonoptera libatrix—Common.
Habrostola tripartita—Common.
triplasia—Common.
Plusia chrysitis—Common.
festucæ—Common.
pulchrina—Common.
gamma—Common.
Anarta myrtilli—Mourne Mountains, common.
Phytometra viridaria — Mourne Mountains and Belfast hills; common.
Rivula sericealis—Common.
Zanclognatha grisealis—Common.
tarsipennalis—Common.
Pechypogon barbalis—Common.
Hypena proboscidalis—Very abundant.

GEOMETRÆ.

Ourapteryx sambucata—Belfast.
Epione apiciaria—Belfast, scarce.
Rumia luteolata—Very abundant.
Metrocampa margaritaria—Common.
Ellopia fasciaria — Donard demesne, common.
Selenia bilunaria—Common.
Odontopera bidentata—Common.
Crocallis elinguaria—Common.

Ennomos quercinaria — Tollymore Park, &c.
Phigalia pedaria—Common; large and pale coloured.
Nyssia zonaria—Ballycastle, very abundant.
Amphidasys betularia—Common.
Boarmia repandata — Common; rather dark; var. *conversaria*, Donard demesne, scarce.
gemmaria — Common.
Tephrosia crepuscularia—Donard demesne, common; dark varieties frequently occur.
Gnophos obscurata — Newcastle, abundant; very dark.
Pseudoterpna pruinata—Common.
Venusia cambrica—Donard demesne, scarce.
Acidalia didimiata—Common.
bisetata—Common.
marginepunctata—Kilkeel, scarce.
aversata—Common; var. *spoliata*, common.
Cabera pusaria—Very abundant; the specimens from this district are rather more sprinkled with black scales than is the case with English specimens.
exanthemaria—Very abundant.
Macaria liturata — Donard demesne.
Strenia clathrata—Common; the yellow parts of the wings pale, inclining to white.
Scodiona belgiaria—Mourne Mountains.
Ematurga atomaria—Hills, abundant.
Bupalus piniaria — Donard demesne, very abundant.
Abraxas grossulariata—Common.
Lomaspilis marginata—Common.
Hybernia rupicapraria—Common.
marginaria — Common; dusky, ill-marked specimens are frequent.
defoliaria—Common.
Cheimatobia brumata—Common.
Oparabia dilutata—Common.
filigrammaria—Belfast hills.
Larentia didymata—Very abundant.
multistrigaria—Common, generally of an ochreous tint.
cæsiata—Belfast hills, abundant; Mourne Mountains, scarce.
salicata—Belfast hills, common.
olivata—Glenariffe.
viridaria—Common.
Emmelesia alchemillata—Bryansford.
albulata — Common; dark and well marked.
decolorata—Belfast, locally abundant.
tæniata—Donard demense, very rare.
Eupithecia oblongata—Common.
satyrata—Common; var. *callunaria*, very abundant on hills; very variable, some specimens approaching v. *Curzoni*.
castigata—Common; occasional melanic specimens occur.
indigata—Belfast.
constrictata—Islandmagee, common; Kilkeel.
nanata—Common on hills.
vulgata—Common.
absynthiata—Common.
minutata—Common.
assimilata—Common.
lariciata—Collin Glen; Larne, very abundant.
abbreviata—Scarce.
sobrinata—Belfast, and Mourne Mountains, scarce.
pumilata—Common; very abundant on Mourne Mountains.
Thera variata—Common.
firmata—Donard demesne, scarce.
Hypsipetes trifasciata—Common; very abundant in Collin Glen.
sordidata—Common.
Melanthia bicolorata—Glenarm, Collin Glen, &c., not common.
ocellata—Collin Glen, &c.
albicillata — Donard demesne, common.
Melanippe tristata — Knockagh, abundant; Mourne Mountains.
sociata—Common.
montanata—Very abundant.

galiata—Local, not common.
fluctuata—Common.
Anticlea badiata—Very abundant.
nigrofasciaria—Collin Glen, scarce.
Coremia munitata—Local, scarce.
designata—Scarce.
ferrugata—Common.
unidentaria—Common.
Camptogramma bilineata—Very abundant.
Phibalapteryx lapidata—Belfast Hills.
vittata—Belfast marshes, very abundant.
Cidaria miata—Common.
truncata—Common, mostly var. *perfuscata*.
immanata—Common.
saffumata—Common.
silaceata—Collin Glen, common.
testata—Hills, common.
populata—Common.
fulvata—Common.
Pelurga comitata—Common.
Eubolia limitata—Very abundant.
plumbaria—Very abundant.
Anaitis plagiata—Black Mountain, common.

PYRALIDES.

Pyralis glaucinalis—Common.
farinalis—Common.
Scoparia ambigualis—Scarce.
cembræ—Belfast, common.
dubitalis—Common.
ingratella—Knockagh, common.
truncicololella—Donard demesne.
augustea—Dundrum.
Nomophila noctuella—Common.
Herbula cespitalis—Common.
Ennychia cingulata—Knockagh, common.
Burrhypara urticata—Common.
Scopula lutealis—Very abundant.
olivalis—Common.
prunalis—Collin Glen, &c.
ferrugalis—Islandmagee, scarce.
Botys fuscalis—Common.
Ebulea sambucalis—Common.
Pionea forficalis—Common.
Cataclysta lemnata—Common.
Hydrocampa stagnata—Common.
Chrysocorys festaliella—Belfast.
Platyptilia ochrodactyla—Dunnaneile Island, Strangford Lough.
isodactyla—Belfast Hills, scarce.
gonodactyla—Common.
Amblyptilia acanthodactyla—Newcastle and Belfast, scarce.
Oxyptilus parvidactyla—Knockagh, abundant.
Mimeseoptilus bipunctidactylus—Black Hill, &c., abundant.
pterodactylus—Black Hill, abundant.
Pterophorus monodactylus—Common.
Aciptilia tetradactyla—Islandmagee, scarce.
Chilo phragmitellus—Black Mountain, scarce.
Crambus pratellus—Common.
perlellus—Common.
warringtonellus—Sandhills, common.
geniculeus—Sandhills, common.
culmellus—Very abundant.
tristellus—Common.
hortuellus—Common.
Homeosoma senecionis—Newcastle, scarce.
Phycis fusca—Mourne Mountains.
subornatella—Islandmagee, rare.
Aphomia sociella—Common.

TORTRICES.

Tortrix cratægana—Common.
xylosteana—Scarce.
rosana—Scarce.
diversana—Common.
unifasciana—Belfast Hills, &c., common.
costana—Common.
viburnana—Hills, common.

palleana—Black Hill, &c., common.
viridana—Common.
Peronea Schalleriana — Islandmagee.
variegana—Common.
hastiana—Belfast, scarce.
caledoniana—Hills, common.
Teras contaminana—Common.
Dictyopteryx Lœflingiana—Common.
Holmiana—Belfast, scarce.
Bergmanniana—Very abundant.
Argyrotoxa Conwayana—Common.
Penthina sauciana—Common.
gentiana—Common.
Antithesia salicella—Belfast, scarce.
Hedya ocellana—Common.
Spilonota trimaculana — Common.
Pardia tripunctana—Common
Sericoris littoralis—Islandmagee.
cespitana—Common.
lacunana—Very abundant
Mixodia Schulziana—Hills, common.
Orthotænia antiquana—Belfast.
Cnephasia politana—Donard demesne, &c., common.
musculana—Common.
Sciaphila virgaureana — Common.
chrysantheana—Common.
octomaculana—Rare.
Sphaleroptera ictericana—Scarce.
Clepsis rusticana—Common.
Bactra lanceolana—Very abundant.
Phoxopteryx myrtillana—Belfast Hills, scarce.
lundana—Very abundant.
Grapholitha nigromaculana—Mourne Mountains.
subocellana—Very abundant.
trimaculana—Belfast.
Penkleriana -Common.
nævana—Common
Batodes angustiorana—Belfast.
Pædisca bilunana—Belfast, scarce.
corticana—Belfast, common.
Ephippiphora cirsiana — Common.
brunnicheana—Common.
Olindia ulmana—Donard demesne, scarce.
Pamplusia mercuriana—At top of Slieve Bingian (2400 feet).
Stigmonota perlepidana—Collin Glen, abundant.
Dicrorampha plumbana—Knockagh, abundant.
Catoptria ulicetana—Very abundant.
hypericana—Belfast Hills.
cana—Belfast Hills.
citrana—Belfast, scarce.
Simæthis oxyacanthella—Very abundant.
Eupæcilia dubitana—Belfast, scarce.
atricapitana—Belfast, scarce.
angustana—Common.
griseana—Scarce.
ciliella—Hills, common.
Xanthosetia zœgana—Common.
hamana—Common.
Argyrolepia Hartmanniana—Belfast Hills, local.
Conchylis straminea—Islandmagee.
Aphelia osseana—Common.

TINEÆ.

Diurnea fagella—Common; always ochreous.
Scardia cloacella—Common.
Blabophanes rusticella—Common.
Tinea pellionella—Common.
pallescentella—Common.
lapella—Common.
merdella—Common.
Lampronia luzella—Belfast, scarce.
Nemophora Schwarziella—Common.
Swammerdamia cæsiella—Very abundant.
pyrella—Common.
spiniella—Common.

Hyponomeuta padellus—Common.
cagnagellus—Locally common.
Prays curtisellus—Common.
Plutella cruciferarum—Common.
Cerostoma radiatella—Common.
costella—Common.
Harpipteryx xylostella—Common.
Phibalocera quercana—Common.
Depressaria costosa—Very abundant.
pallorella—Scarce.
umbellana—Newcastle, scarce.
arenella—Common.
liturella—Common.
yeatiana—Common.
applana—Common.
heracleana—Common.
Gelechia ericetella—Common.
Bryotropha terella—Belfast.
desertella—Newcastle sand-hills.
politella—Belfast.
Lita artemisiella—Newcastle sand-hills.
marmorea—Newcastle sand-hills, very abundant.
Teleia vulgella—Scarce.
dodecella—Belfast Hills, scarce.
Cherlaria Hubnerella—Belfast.
Pleurota bicostella—Hills, common.
Œcophora pseudospretella—Common.
Endrosis fenestrella—Common.
Glyphipteryx thrasonella—Very abundant in marshes.
Haworthana—Belfast, scarce.
equitella — Islandmagee, abundant.
Fischeriella—Common.
Argyresthesia ephippella—Belfast.
nitidella—Common.
semitestacella—Belfast, scarce.
albistria—Belfast, common.
conjugella—Common.
mendica—Common.
pygmæella—Scarce.
Gracilaria tringipennella—Islandmagee, scarce.
syringella—Common.
Ornix anglicella—Belfast.
betulæ—Belfast.
Coleophora albicosta—Belfast.
cæspititiella—Common.
Chauliodus chærophylellus—Belfast.
Laverna atra—Belfast.
Elachista monticola — Ballynahinch.
perplexella—Common.
obscurella—Common.
rhynchosporella—Belfast, scarce.
rufocinerea—Belfast, scarce.
subalbidella—Very abundant.
argenteila—Very abundant.
Lithocolletis pomifoliella—Belfast.
salicicolella—Belfast.
quercifoliella—Belfast, common.
alnifoliella—Belfast.

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A SUPPLEMENT

TO THE

FLORA

OF THE

NORTH-EAST OF IRELAND

OF

STEWART AND CORRY.

BY

S. A. STEWART, F.B.S.EDIN.,

AND

R. LLOYD PRAEGER, B.E.

BEING AN APPENDIX (NO. 5 OF VOL. 2) TO THE PROCEEDINGS OF THE

BELFAST NATURALISTS' FIELD CLUB

FOR 1894-95.

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NOTE.

The size of the page in the following paper has been made the same as that of "*Flora of the North-East of Ireland*," in order that the Supplement may be bound with the Work by those who desire it.

A SUPPLEMENT

TO THE

"FLORA OF THE NORTH-EAST OF IRELAND"

OF STEWART AND CORRY.

By S. A. STEWART, F.B.S.Edin., and R. LLOYD PRAEGER, B.E.

IT is now within a few months of seven years since the *Flora of the North-East of Ireland* was published, affording botanists a summary of our knowledge of local topographical botany, and giving a general account of the flora of the twelfth district of *Cybele Hibernica*. Since that time, considerable progress has been made; a goodly number of species have been added to the flora, and our knowledge of the distribution of others has been augmented to a noteworthy degree. Since the publication of *Flora* several papers have appeared summarizing the more important additions, and others dealing with the botanical characteristics of certain tracts of country, or with certain groups of plants within our district. There have also appeared scattered notes on the local flora in Journals, and Proceedings of Societies. Our present object has been to bring all these together, along with a considerable amount of unpublished material, and no pains have been spared to make this Supplement complete and trustworthy, by inviting the assistance of local botanists, by examining herbaria, and published and unpublished matter not accessible formerly, and by carrying out systematic field work in selected districts, and searches for plants whose local status required investigation.

Being a Supplement to the *Flora of the North-East of Ireland*, the present paper divides itself into two sections:—(1) Plants or records to be removed from the *Flora*; and (2) plants or records to be added to the *Flora*. The former category, we are glad to say, is soon disposed of. The following species must be withdrawn from the list of native and naturalized plants, for the reasons stated in the systematic list that follows:—

Ononis spinosa.
Rosa micrantha.
Silaus pratensis.
Calamintha officinalis.
Primula veris.

A few varieties have also to be withdrawn, and a few records require to be transferred to plants different from those under which they were published; these corrections are made in their proper place.

There are a number of other plants for which no recent record could be given in *Flora*, and for the presence of which in the district now we cannot vouch, although many of them have been specially sought for, for the purpose of this Supplement; and there are a few others which recent changes have driven from former haunts. The refinding of these plants is much to be desired, so we draw attention here to the more prominent of them. They may be subdivided as follows:—

(1) Plants of which we have reason to doubt the identification:—

Leontodon hispidum. *Gentiana amarella.*

(2) Plants which appear to have been not established in the district, and now missing:—

Sisymbrium sophia. *Solanum nigrum.*
Sinapis nigra. *Chenopodium rubrum.*

(3) Plants apparently destroyed through drainage; these are mostly plants of Lough Neagh basin:—

Rhamnus catharticus. *Carex elongata.*
Lathyrus palustris. *C. filiformis.*
Sium latifolium. *C. paludosa.*
Epipactis palustris. *Lastrea thelypteris.*
Cephalanthera ensifolia. *Pilularia globulifera.*

(4) Plants apparently lost though building or cultivation:—

Eleocharis uniglumis. *Hordeum pratense.*
Schlerochloa procumbens.

Three other plants:—*Hypericum hirsutum*, *Adoxa moschatellina*, *Carex muricata*, have become almost extinct owing to similar causes.

(5) Plants not seen recently, but for whose absence no special reason exists:—

Geranium sanguineum. *Taxus baccata.*
Trifolium striatum. *Calamagrostis epigejos.*
Pyrus aria. *Poa nemoralis.*
Arctostaphylos uva-ursi. *Polypodium dryopteris.*
Pyrola secunda. *Tolypella nidifica.*

We trust that our drawing attention to the above may lead to the rediscovery of some of them.

Turning now to the second part of our work—additions to the *Flora*—we find a considerable amount of new matter available, thanks to the diligence of a number of northern botanists. The chief systematic investigations carried out in our district since the publication of *Flora* have been the exploration of the Mourne Mountains district for cryptogams by Mr. Lett, and for phanerogams by the present writers; and the examination of the valley of the Lower Bann by Mrs. Leebody, Miss Knowles, and R. Ll. P. The subjoined list shows the various sources from which the material of the present Supplement has been drawn.

SOURCES OF INFORMATION.

Books—

English Botany; Supplement to Vols. I—IV. By N. E. Brown. 1892.

The British Moss Flora, by Dr. Braithwaite, Vols. I. and II., 1880-95.

Periodicals—

Journal of Botany, 1888 to date. Contains some notes concerning the local flora.

Irish Naturalist, 1892 to date. Papers and notes, the more important papers being:—

Stewart, S. A.—Notes on the Flora of the North-East of Ireland, 1894.

Shoolbred, W. A.—A Botanical Trip to Co. Antrim, 1894.

Groves, H. & J.—The Distribution of the Characeæ in Ireland, 1895.

Proceedings of Societies—

Royal Irish Academy. The papers consulted are:—

Hart, H. C.—Plants of some of the Mountain Ranges of Ireland, 1884. This paper yielded some notes additional to those already extracted from it.

Lett, Rev. H. W.—Report on the Mosses, Hepatics, and Lichens of the Mourne Mountain district, 1890.

Hart, H. C.—Range of Flowering Plants and Ferns on the Mountains of Ireland, 1891. Yields very little additional to the former paper.

Stewart, S A., and R. Lloyd Praeger.—Botany of the Mourne Mountains, 1892. Our increased knowledge of the Co. Down flora is mainly due to this paper, and that by Rev. Mr. Lett.

Belfast Naturalists' Field Club, 1888-9 till 1894-5. Papers and notes, including plants found on the Excursions.

Praeger.—New or Rare North of Ireland Plants, 1891.

Do. —Local Botanical Notes, 1891 and 1892; 1893.

Botanical Exchange Club Reports, 1888 till 1894.

Watson Botanical Exchange Club Reports, 1885—6 till 1893—4.

MS. Notes and Lists—

Templeton, John. Four volumes of his MS. "Flora Hibernica," at present deposited with the Belfast Nat. Hist. and Phil. Society. Contains much original matter concerning local cryptogams, which could not be worked out in time for the present paper.

Brown, Robert. We are indebted to Mr. James Britten for a transcript of local notes contained in the two volumes of MS. in British Museum, mentioned in his review of *Flora N. E. Ireland* in *Journ. Bot.* 1888.

Leebody, Mrs.
Knowles, Miss M. C.
Lett, Rev. H. W.
Waddell, Rev. C. H.
Brenan, Rev. S. A.
Smith, Rev. W. S.
Davies, J. H.
} Notes referring to various districts, kindly supported by specimens when requested.

To several other observers we are indebted for occasional notes of plants observed by them in new stations, and for specimens sent.

HERBARIA—

Moore, David. The greater portion of the original and duplicate sets representing the flora of Co. Antrim, and of the duplicate set representing the flora of Co. Derry, made by Dr. Moore in 1836 and 1837, when in the Ordnance Survey service, are deposited in the Dublin Science and Art Museum. The duplicate set is unfortunately not localized.

Trinity College, Dublin. The British Herbarium, which includes the northern collection of Rev. W. M. Hind, was looked into, but yielded nothing of importance for our purpose.

Glasnevin Botanic Garden. The British Herbarium contains some of Dr. Moore's northern plants, but too little was found to induce a thorough examination of the collection.

Grainger, Rev. Canon. A small collection, made chiefly in Antrim, which yielded a few notes.

The addition of our own MS. notes to this list completes the enumeration.

The notes now brought together include a number of important additions to the flora of the north-eastern province. In the lists of additions which follow, the members of two critical genera—*Rubus* and *Hieracium*—figure largely. While the value of the multitudinous "species" into which these genera are now divided must not be over-estimated, it is none the less important that the distribution of the various forms should be accurately worked out, and in this respect our district is now behind no other in Ireland. Some interesting species have been added, such as *Carex pauciflora* (a good addition to the Irish flora), *Polygonum maculatum* and *Sparganium neglectum*, of which we are not aware of any previous record from Ireland, *Spiranthes Romanzoviana* (in Europe known only in two other Irish counties), *Ranunculus circinatus*, *Drosera intermedia*, *Saussurea alpina*, *Orchis pyramidalis*, *Carex aquatilis*. The following lists show the additions to the Phanerogams and higher Cryptogams of District 12 and to each of the three counties that compose it, the Mosses and Hypatics being treated separately on a subsequent page.

ADDITIONS TO DISTRICT 12.

Rununculus circinatus.
Drosera intermedia.
Trifolium hybridum.
Poterium sanguisorba.
Rubus Rogersii.
nitidus.
gratus.
erythrinus.
Lindleianus.
pulcherrimus.
silvaticus.
micans.
Leyanus.
echinatus.
rudis.
scaber.
fuscus.
rosaceus.
hirtus.
chamœmorus.
Rosa glauca.
Arctium minus.
Saussurea alpina.
Hieracium Leyi.
Farrense.
rubicundum.
argenteum.
Sommerfeltii.
hibernicum.
stenolepis.
euprepes.
sciaphilum.
auratum.
Polygonum maculatum.
Orchis pyramidalis.
Spiranthes Romanzoviana.
Sparganium neglectum.
Potamogeton undulatus.
Carex pauciflora.
aquatilis.
filiformis.
Triticum acutum.
Chara contraria.

ADDITIONS TO COUNTY DOWN.

Ranunculus circinatus.
Lepidium campestre.
Drosera intermedia.
Sagina ciliata.
Spergularia rubra.
Hypericum quadrangulum.
Trifolium hybridum.
Rubus suberectus.
plicatus.
Rogersii.
nitidus.
Lindleianus.
pulcherrimus.
silvaticus.
mucronatus.
Leyanus.
rudis.
scaber.
fuscus.
rosaceus.
hirtus.
Rosa involuta.
Epilobium angustifolium.
Saxifraga tridactylites.
Inula helenium.
Saussurea alpina.
Hieracium argenteum.
hibernicum.
sciaphilum.
gothicum.
auratum.
Galeopsis speciosa.
Polygonum maculatum.
Salix purpurea.
Populus tremula.
Sparganium neglectum.
Potamogeton Zizii.
Ruppia rostellata.
Eleocharis acicularis.
Carex Œderi.
Bromus racemosus.
Triticum acutum.
Chara contraria.

ADDITIONS TO COUNTY ANTRIM.

Arabis hirsuta.
Geranium perenne.
Trifolium hybridum.
Poterium sanguisorba.
Rubus gratus.
Lindleianus.
pulcherrimus.
echinatus.
rosaceus.
Rosa glauca.
Arctium minus.
Hieracium flocculosum.
Farrense.
rubicundum.
Hieracium stenolepis.
euprepes.
auratum.
Vaccinium oxycoccos.
Utricularia intermedia.
Callitriche autumnalis.
Orchis pyramidalis.
Juncus maritimus.
Potamogeton undulatus.
Carex pauciflora.
aquatilis.
filiformis.
Schlerochloa rigida.
Triticum acutum.

ADDITIONS TO COUNTY DERRY.

Papaver rhœas.
Meconopsis cambrica.
Viola canina.
Sagina apetala.
Spergularia salina.
Ononis arvensis.
Trifolium hybridum.
Rubus rhamnifolius.
gratus.
pulcherrimus.
Lindleianus.
erythrinus.
micans.
chamœmorus.
Myriophyllum spicatum.
Galium mollugo.
Hieracium Leyi.
Sommerfeltii.
Hieracium stenolepis.
euprepes.
Myosotis collina.
Veronica polita.
Beta maritima.
Atriplex erecta.
Orchis pyramidalis.
Spiranthes Romanzoviana.
Carex teretiuscula.
stricta.
paludosa.
riparia.
Trisetum flavescens.
Ceterach officinarum.
Chara aspera.
contraria.
vulgaris.
Nitella translucens.

As it must ever be, there has been in some cases doubt as to what plants, originally introduced, must now be included in the flora as thoroughly naturalized, and which may be considered as not permanently established. Time alone can settle these points, and we have preferred to err on the side of severity rather than of leniency as regards admissions to the flora on the plea of naturalization. The number of foreign plants introduced into the country is increasing, along with the increased imports of foreign grain and seed, and no doubt some of the hardy continental species thus introduced have obtained, or will obtain, a permanent footing in the island. The following extraordinary list of imported

plants, collected by Mr. Richard Hanna in 1893 and 1894 in waste ground adjoining the Belfast Distillery, and near Hughes' Flour Mill, will convey an idea of the number of aliens that are now-a-days showered down on our country :

Ranunculus muricatus.
Sisymbrium repandum.
S. pannonicum.
S. columnæ.
S. sophia.
S. thalianum.
Lepidium draba.
L. campestre.
L. perfoliatum.
Camelina sativa.
Reseda lutea.
R. suffruticulosa.
Saponaria baccaria.
Silene inflata.
S. dichotoma.
Lychnis vespertina.
Geranium phæum.
G. pratense.
Melilotus arvensis.
M. parviflora.
Medicago denticulata.
M. falcata ?
Trifolium arvense.
T. resupinatum.
T. latipaceum.
Trigonella cœrulea ?
Lonicera caprifolium.
Valerianella dentata.
Anthemis cotula.
Hemizonia sp.
Serratula tinctoria.
Centaurea solstitialis.
Carduus crispus.
Solanum nigrum.
Echium vulgare.
Amsinckia lycopsoides.
Salvia verticillata.
Stachys annua.
Marrubium vulgare.
Plantago arenaria.
Rumex palustris.
Hemerocallis flava.
Setaria viridis.
Ægilops ovata ?
Æ. caudata.
Echinochloa crus-galli.
Bromus tectorum.

The plants were introduced with foreign grain, Australian, Indian, Russian, and American. A smaller group found by Mrs White-Spunner at Greenisland, whither they came with food for fowls, is given by R. Ll. P. in *Irish Naturalist* for 1893.

Sisymbrium sophia.
Thlaspi arvense.
Erysimum orientale.
Lychnis vespertina.
Linum perenne.
Melitotus alba.
Cichorium intybus.
Hyoscyamus niger.
Linaria sp.
Galeopsis speciosa.

Other similar lists might be quoted, but the above will serve as examples.

During the interval since the publication of the *Flora* much has been done to extend our knowledge of the *Musci* and *Hepaticæ* of the district. The workers, indeed, have been few, our notes being derived mainly from Rev. H. W. Lett and Rev. C. H. Waddell, to whose zeal and powers of observation we are indebted for by far the larger portion of the information summarised in the following pages.

In 1888 the number of species of mosses known to grow in north-east Ireland

stood at 293, and the hepatics, or scale-mosses, at 73. The present enumeration brings the former up to 301, and the latter to 84. Almost a moiety of the mosses known to occur in the British Islands, and more than a moiety of the scale-mosses, are still *desiderata* for our district. That in the future our lists will be added to cannot be doubted, especially in the minute and critical species. The publication of Dr. Braithwaite's splendid "British Moss Flora" has been a stimulus to present workers, and its completion cannot fail to stimulate and facilitate future researches. A similar Monograph of British *Hepaticæ* would be a boon. That this interesting group of plants is still imperfectly known to us is largely due to the want of such help. The publishing of additional species is, however, the smaller portion of the labour of the local botanist. A great amount of work has been done, and much remains to be done, in extending our knowledge of the range and frequency of the plants already on record.

These lists might have been larger had a laxer method of compilation been adopted. Many notes have been held over where satisfactory specimens were not forthcoming, and doubtless some of these excluded records will prove correct hereafter. As regards the few notes of Antrim mosses by Mr. Dixon, they stand on the sufficient authority of that gentleman alone. Extracted from the Templeton MSS. we print at the end a number of localities for hepatics not included in the authenticated list. Many of these are believed to be reliable, while some are manifestly incorrect. No specimens are extant wherewith to test these notes, and their confirmation or otherwise remains for the future.

ADDITIONS TO DISTRICT 12.

Anisothecium crispum.
Polytrichum attenuatum.
Tortula princeps.
Grimmia orbicularis.
G. Hartmani.
Pohlia acuminata.
Mnium riparium.
Hypnum irriguum.
Sphagnum Austini.
S. teres.
Lejeunea microscopica.
Lejeunea Mackaii.
L. patens.
Odontoschisma sphagni.
Leptoscyphus pyrenaicum.
Scapania umbrosa.
Plagiochila tridenticulata.
Jungermannia pumila.
J. crenulata.
Nardia sphacelata.
Lunularia cruciata.

ADDITIONS TO COUNTY DOWN.

Polytrichum attenuatum.
Mollia verticillata.
Grimmia orbicularis.
Pohlia acuminata.
Bryum proliferum.
Hypnum irriguum.
H. Kneiffii.
H. pulchellum.
Sphagnum teres.
Lejeunea Mackaii.
Odontoschisma sphagni.
Cephalozia divaricata.
C. connivens.
Leptoscyphus interruptus.
Scapania umbrosa.
S. curta.
Jungermannia crenulata.
Nardia sphacelata.
Lunularia cruciata.
Anthoceros punctatus.

ADDITIONS TO COUNTY ANTRIM.

Oligotrichum incurvum.
Pottia Starkei.
Anisothecium crispum.
Webera sessilis.
Grimmia trichophylla.
G. Hartmani.
Orthotrichum stramineum.
Tetraplodon bryoides.
Funaria obtusa.
Mnium cuspidatum.
M. riparium.
Hypnum heteropterum.
H. Borreri.
Sphagnum Austini.
S. tenellum.
S. intermedium.
Frullania fragillifolia.
Lejeunea microscopica.
L. calcarea.
L. patens.
L. Mackaii.
Pleurozia purpurea.
Odontoschisma sphagni.
Trichocolea tomentella.
Plagiochila tridenticulata.
Jungermannia pumila.
Nardia hyalina.
Cesia crenulata.
Lunularia cruciata.

The only additions to County Derry are *Polytrichum urnigerum*, *Pottia Heimii*, *Tortula princeps*, *Mollia inclinata*, *Bryum ventricosum* and *Sphagnum subsecundum* var. *obesum*. Several named varieties are also added to preceding counties.

In the systematic list which follows, the authors have personally examined specimens of the greater portion of the plants recorded, and have taken pains to satisfy themselves of the correctness of the remainder. In the case of critical plants, the opinion of an authority has in all cases been obtained and followed. All plants concerning the identity of which there was any doubt, have been omittted; a number of records of *Rubi* are held over for this reason. The sequence and nomenclature of *Flora* have been followed throughout for sake of uniformity, except in those critical genera where the greatly extended knowledge which now prevails rendered it necessary to introduce the present terminology—thus the *Hieracia* are arranged and named according to Mr. Hanbury's list in *Journal of Botany*, July 1894, and Rev. Moyle Rogers has kindly revised our *Rubus* list so as to bring it into accordance with the ninth edition of *London Catalogue*.

We have to acknowledge gratefully assistance received in their special departments from Mr. J. G. Baker, Mr. Arthur Bennett, Monsieur Crepin, Messrs H. and J. Groves, Mr. F. J. Hanbury, and Rev. W. Moyle Rogers; to all of whom, as well as the various local botanists who have contributed, our best thanks are due.

For the editing of the *Phanerogamia*, and *Cryptogamia* as far as the end of *Characeæ*, R.Ll.P. is responsible; S.A.S. is accountable for the *Musci* and *Hepaticæ*.

15*th May*, 1895.

ABBREVIATIONS.

Herb. D.M.—Herbarium of Dr. David Moore, now in Dublin Science and Art Museum.

Hart *R.I.A.*—H. C. Hart: Plants of some of the Mountain Ranges of Ireland. *Proc. Royal Irish Academy*, 1884. The one or two references to Mr. Hart's subsequent report on the Mountain Plants of Ireland are distinguished by the date 1891.

Lett *R.I.A.*—Rev. H. W. Lett: Report on the Mosses, &c.,of the Mourne Mountain district, *Proc. Royal Irish Academy*, 1890.

S. & P.—Stewart and Praeger: Report on the Botany of the Mourne Mountains, *Proc. Royal Irish Academy*, 1892.

B.N.F.C.—Proceedings of the Belfast Naturalists' Field Club.

B.E.C.—Botanical Exchange Club Report.

Journ. Bot.—Journal of Botany.

I.N.—Irish Naturalist.

Shoolbred *I.N.*—W. A. Shoolbred, "A Botanical Trip to Co. Antrim," *Irish Naturalist*, 1894.

Groves *I.N.*—H. & J. Groves, "The Distribution of the *Characeæ* in Ireland," *Irish Naturalist*, 1895.

H W.L.—Rev. H. W. Lett, M.A.

C.H.W.—Rev. C. H. Waddell, B.D.

S.A.S.—Samuel Alexander Stewart.

R.Ll.P.—R. Lloyd Praeger.

PHANEROGAMIA.

RANUNCULACEÆ.

Thalictrum minus L., var. β **T. montanum** Wallr. 300—1600 feet.
Down—Pigeon Rock Mountain and Cove Mountain, S. & P.

T. flavum L.
Antrim—Langford Lodge, R.Ll.P.

Ranunculus trichophyllus Chaix.
Down—Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2. Ditches below Newtownards, and pool on Conlig Hill, R.Ll.P.
Antrim—Stoneyford Reservoir, R.Ll.P.

R. heterophyllus Fries.
Down—Magheralin, C.H.W. Ditches near Crawfordsburn and Helen's Tower, R.Ll.P. "Moneyreagh River," printed in some copies of *Flora*, should be "Moneycaragh River."

R. Baudotii Godr. The plant recorded from Saintfield under this name in *Watson B.E.C. Report* 1893-94, is transferred to *R. peltatus*.

R. floribundus Bab. Specimens from Clandeboye lower lake have been doubtfully placed under this form by A. Bennett in *Watson B.E.C. Report* 1891-2. Further investigation is required.

R. penicillatus Dum.
Antrim—Abundant in Main R. from Randalstown to Lough Neagh, and in Braid R. at Ballymena, R.Ll.P.

R. peltatus Fries.
Down—Greencastle, Lisnacree, and Lough Island Reavy, S. & P. Common in the county.
var. **truncatus** Hiern.
Down—Ballyagherty near Saintfield, C.H.W., *Watson B.E.C.* 1893-4. Lough Mann, C.H.W.

R. circinatus Sibth.
Down—In the Lagan Canal close to its junction with Lough Neagh, R.Ll.P., *B.N.F.C.* 1892-3. An important extension of range.

R. hederaceus L. 0—1000 feet in the Mournes, S. & P.

R. flammula L. Ascends to 1700 feet in the Mournes, S. & P.

var. β **pseudo-reptans** Syme.

Down—Near Hilltown, S. & P.

R. lingua L.

Down—North side of Pollramer Lough, Richd. Hanna. Marshes south of Ballydugan Lake, R.Ll.P.

Derry—Near Dungiven, Mrs. Leebody.

R. auricomus L.

Down—Rostrevor, S. & P. Glen at Knocknagoney near Holywood, R.Ll.P.

Antrim—Cushendall, Herb. D.M. Glendun, S. A. Brenan. Stoneyford, Crumlin, Langford Lodge, R.Ll.P.

Derry—Near Bellarena, Mrs. Leebody.

R. acris L. Ascends to 2450 feet in the Mournes, S. & P.

var. β **R. tomophyllus** Jord.

Down—Near Warrenpoint, S. & P. Perhaps frequent in the district.

R. repens L. Ascends to 1300 feet in the Mournes, S. & P.

Aquilegia vulgaris L.

Down—By the Shimna River near Newcastle, apparently well established, S. & P. It grows here on rough heathy ground, at a distance from any house, and has increased during the last ten years, R.Ll.P.

NYMPHÆACEÆ.

Nymphæa alba L.

Down—In almost every lake and pond.

Derry—Lakelets near Kilrea, and abundant in Killelagh Lough above Maghera, R.Ll.P.

PAPAVERACEÆ.

Papaver hybridum L.

Down—Roadside half-way between Killough and Ardglass, R.Ll.P., *B.N.F.C.* 1892-3.

P. rhœas L.

Down—Ardglass, S.A.S.

Derry—Fields near Magilligan railway station, R.Ll.P.

The plant is still abundant at its old stations, Killough Bay and Lisburn.

[**P. somniferum** L.

Down—Abundant in field near Rostrevor, S. & P.]

Meconopsis cambrica (Linn.) Vig.

Down—Ascends to 1300 feet at Rostrevor, S. & P. It ranges up and down the valley for several hundred feet, being abundant at one spot.

Derry—Magilligan braes, S. A. Brenan.

Glaucium flavum Crantz.

Down—Mill Bay in Carlingford Lough, Leestone near Kilkeel, and refound in Templeton's station "5 miles south of Newcastle" (Glasdrumman), S. & P.

FUMARIACEÆ.

Fumaria capreolata L. var. α **F. pallidiflora** Jord.

Common in Down and Antrim. Derry distribution not yet worked out.

var. δ **F. muralis** Sonder.

Down—Saintfield, C.H.W.; *Watson B.E.C. Report* 1893-4.

F. officinalis L.

Frequent throughout Down and Antrim.

CRUCIFERÆ.

Cheiranthus cheiri L.

May fairly be reckoned as a naturalized plant in certain stations in the district, as ancient buildings at Quoile Castle, Carrickfergus Castle, and Larne.

Nasturtium palustre (Willd.) DC.

Down—Rostrevor and Narrow-Water, S. & P. Crossgar, R.Ll.P.

Antrim—Glendun, Shoolbred *I.N.* Bushfoot, R.Ll.P.

Barbarea vulgaris R.Br.

Down—Frequent in the Mourne district, S. & P. Crawfordsburn, Newtownards, Ballygowan, Downpatrick, R.Ll.P.

Derry—Kilrea and Bellarena, Mrs. Leebody.

B. intermedia Bor.

Down—Moygannon, Rostrevor, Killowen, Newcastle, S. & P. Scrabo and Conlig, R.Ll.P.

Antrim—Stoneyford, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

[**B. præcox** R.Br.

Down—Cultivated ground at Struell wells near Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.]

Arabis hirsuta (L.) R.Br.

Antrim—Tievebulliagh Mountain, S. A. Brenan.

Derry—Still plentiful in sandy fields and on sandhills at Magilligan, Mrs. Leebody, also R.Ll.P.

In Herb. D.M. is a note recording this plant from Cave Hill, Knockagh, and Torr Head, but we fear some mistake was made, as the plant has never been seen by any other botanist in these well-known places.

Cardamine amara L.

Down—Abundant at the "Witch Hole" on the Lagan at Glenmore near Lisburn, J. H. Davies; S.A.S., *I.N.* 1894.

Sisymbrium thalianum (L.) Gaud.

Antrim—Wall-tops about Larne, Herb.D.M. Cushendun, S. A. Brenan.

Derry—Near Derry City, Mrs Leebody. Magilligan and Castlerock, R.Ll.P.

S. alliaria L.

Down—Scarva Glen, H. W. Lett.

Antrim—Magheragall near Lisburn, and Altmore Glen, R.Ll.P.

[**Erysimum cheiranthoides** L.

Antrim—Wheat-field and roadside between Ballinderry and Lisburn, Herb. D.M.]

Sinapis alba L.

Down—Abundant in fields about Killowen, S. & P. Ardglass (R.Ll.P.), *B.N.F.C.* 1892-3.

Draba incana L.

Derry—Magilligan sandhills, small and not abundant, Mrs. Leebody, 1890. Abundant and fine on sand-dunes a mile N.E. of Magilligan railway station, R.Ll.P., 1894. Still occurs sparingly on Benevenagh cliffs.

D. verna L.

Down—Ballywalter and Ardglass, Templeton MSS. Saintfield, C.H.W.
Antrim—Roadside near Stoneyford, R.Ll.P.

Cochlearia danica L.

Down—Plentiful from Warrenpoint to Greencastle, and at Annalong, S. & P.

Antrim—On limestone rocks, White Park, Herb. D.M.

Derry—Portstewart, Mrs. Leebody. Common by the Bann from Coleraine to the sea, R.Ll.P.

[**Camelina sativa** L.

Down—Newtownards, E. F. Linton, 1871, Herb. F. J. Hanbury.

Antrim—Flax fields, Broughshane, Herb. Canon Grainger. Larne Curran, R.Ll.P.

Derry—Magilligan, Herb. D.M. Among flax above Garvagh, R.Ll.P.]

Thlaspi arvense L.

Down—Abundant in fields at Killowen, S. & P.

Lepidium campestre (L.) R. Br.

Down—Fields at Killowen, S. & P.
Antrim—Ram's Island, H.W.L.

L. Smithii (L.) Hook.

Antrim—Glenravel, R.Ll.P.
Derry—Kilrea and Garvagh, Mrs. Leebody.

Senebiera coronopus (Gaert.) Poir.

Down—Rostrevor, Killowen, Kilkeel, Annalong, S. & P.

[**S. didyma** Pers.

Down—Killough, C.H.W. Railway at Dundrum, S.A.S.
Antrim—Giant's Causeway, Miss Knowles.
Derry—Portstewart, Mrs. Leebody.
Apparently increasing in Ireland, and spreading northward.]

Cakile maritima Scop.

Antrim—Beach at Ballintoy, R. Brown; J. Britten, *Journ. Bot.* 1888, 285.

Raphanus raphanistrum L.
Down—Frequent in Mourne district, S. & P. Dundonald, Ballykinler, Dundrum, R.Ll.P.
Antrim—Frequent in cornfields through the county, Herb. D.M. Rathlin Island, R.Ll.P.
Derry—Upperlands, Kilrea, Garvagh, and Bann mouth, R.Ll.P.

R. maritimus Sm.
Down—Shore near Ballywalter, J. H. Davies, and plentiful from Killough to St. John's Point, S.A.S.; S.A.S., *I.N.* 1894. Cranfield coastguard Station, S. & P.

RESEDACEÆ.

Reseda lutea L. Certainly naturalized at Ballycastle, and probably at Magheramorne also.

VIOLACEÆ.

Viola palustris L. To 1350 feet in the Mournes, S. & P.
Down—Frequent in the Mourne district, S. & P. Near Loughbrickland, H.W.L.
Antrim—Common on the hills and bogs; many stations might be given.

V. sylvatica Fries. Ascends to 2796 feet, Hart *R.I.A.*

V. canina L. To 500 feet in the Mournes, S. & P.
Down—Shores of Lough Island Reavy, Bryansford, and Bloody Bridge, S. & P. Ballywalter, C.H.W.
Antrim—Cushendun, Shoolbred *I.N.* Ram's Island, Bushfoot, Ballycastle, R.Ll.P.
Derry—Kilrea, Mrs. Leebody. Common about the Bann mouth, R.Ll.P.

V. lutea Huds., var. β **V. Curtisii** Forst.
Down—Margin of Castlewellan Lake, S. & P.
Antrim—Cushendun, Ballycastle, Bushfoot, R.Ll.P.

DROSERACEÆ.

Drosera rotundifolia L. To 1550 feet in the Mournes, Hart *R.I.A.* To 1450 feet there, S. & P.

D. intermedia Hayne.

Down—Pools by Kilkeel River at foot of Slieve Bingian, boggy ground by Colligan Bridge on the same stream, and in marshes S.W. of same place, S. & P.

The vague record in *Irish Flora* is thus verified. This station would appear to have been known to Templeton, who writes (MSS. Vol. A) "Drosera longifolia. Stalk scarcely longer than the leaves, capsule constantly three-valved; found in great abundance along with D. rotundifolia and D. anglica in the watery bog at the head of Kilkeel River, Mourne Mountains, August 9th, 1788." It must be noted that we did not find *D. anglica* there, or elsewhere in the district. In another note, after accurately describing *D. anglica*, Templeton writes "this is common on most of our bogs. *D. longifolia* I have not met with except on the watery bog at the head of Kilkeel River, Mourne Mountains."

D. anglica Huds.

Antrim—Slogan Bog near Randalstown, and near Tievebulliagh, Herb. D.M. Frocess near Glarryford, Miss Knowles. Abundant on bogs, both lowland and mountain, throughout northern Antrim, R.Ll.P.

Derry—In bogs near Newtownlimavady and Coleraine, R. Brown; J. Britten, *Journ. Bot.* 1888. Common on bogs near Kilrea and Garvagh, and on the margin of Lough Ouske in the Sperrin Mountains, R.Ll.P.

POLYGALACEÆ.

Polygala vulgaris L. To 2394 feet in the Mournes, S. & P.

var. β. **P. serpyllacea** Weihe. To 1720 feet in the Mournes, S. & P.

Down—In the Mournes, but not common, S. & P. Ballygowan, R.Ll.P.

Antrim—Common on the north Antrim coast, Shoolbred *I.N.*

var. γ **P. grandiflora** Bab.

Derry—Still sparingly on Benevenagh (R.Ll.P.) *B.N.F.C.* 1892-3.

ELATINACEÆ.

E. hydropiper L.

Down—Plentiful at the north end of Lough Brickland, H.W.L.; R.Ll.P., *B.N.F C.* 1890-1.

The record "Near Belfast, Dr. Mateer" (*Flor. Ulst.*) turns out unexpectedly to be correct, as shown by a large series of fine specimens in the herbarium of the late Dr. Boswell, now in possession of Mr. F. J. Hanbury. The specimens, which have been examined by R.Ll.P., bear the label "Lagan Canal near h. tide w. mark, Co. Antrim. Coll. Augt, 1847, and comm. by Dr. Mateer," and they were, no doubt, intended for distribution through the Botanical Exchange Club. It appears improbable that the plant still survives in this station, as the water is now impure, and attempts to refind it have failed.

CARYOPHYLLACEÆ.

[**Saponaria officinalis** L.
Down—Bloody Bridge, S. & P. Mountstewart and Hillsborough, R.Ll.P.
Antrim—Portballantrae, R Ll.P.]

Silene anglica L.
Down—By the Annalong River, Hart *R.I.A.* Hilltown, S. & P.
Derry—Still abundant at Magilligan, Mrs. Leebody, and R.Ll.P.

S. inflata Smith.
Down—Frequent in the Mourne district, S. & P. Dundonald, Conlig Hill, Ballynahinch, R.Ll.P.
Antrim—Shore of Lough Neagh at Shane's Castle, Herb. D.M. Rasharkin, R.Ll.P.

S. maritima With.
Down—Abundant on Conlig Hill, some miles from the sea, at 400-500 feet elevation, R.Ll.P.

S. noctiflora L.
Down—At Holywood, but only as a casual; not seen for some years on Rough Island; seems to be uncertain in its appearance, R.Ll.P.

[**S. dichotoma** Ehrh.
Down—Abundant in several corn-fields between Saintfield and Crossgar. D. Redmond, also C.H.W., 1894. A plant of southern Europe, introduced with seed, apparently not hitherto observed in Ireland.]

Lychnis vespertina Sibth.
Down—Fields between Downpatrick and Strangford, *B.N.F.C.*, 1893-4.

L. diurna Sibth.
Antrim—Plentiful about Cullybackey, Miss Knowles. Shane's Castle, R.Ll.P.

L. githago L.
Down—Maggie's Leap and Killowen, S. & P.
Derry—Fields at Bann mouth, R.Ll.P.

Sagina apetala L.
Down—Warrenpoint, S. & P. Comber, Saintfield, Tullymurry, and near Pointzpass, R.Ll.P.

Antrim—Whitehead, R.Ll.P.

Derry—Walls at Magilligan railway station, R.Ll.P.

S. ciliata Fries.

Down—Sandhills at Newcastle, S. & P.

S. maritima Don.

Down—Killowen and Newcastle, S. & P. Donaghadee and Mahee Island, R.Ll.P.

Antrim—Water-edge at Larne, R. Brown; J. Britten, *Journ. Bot.*, 1888. Portballantrae, R.Ll.P.

S. nodosa (L.) E. Meyer.

Down—Mouth of Causeway Water, S. & P. Victoria Park near Belfast, and at Killough, R.Ll.P.

Derry—Still frequent, as at Magilligan and Bann mouth, Mrs. Leebody, and R.Ll.P. Kilrea, R.Ll.P.

Arenaria verna L.

Antrim—Glenariff, Shoolbred *I.N.* Scawt Hill, R.Ll.P.

A. trinervia L.

Down—Rostrevor, and about Tollymore Park, S. & P.

Antrim—Glenarm, Herb. D.M. Ram's Island, H.W.L. Between Ballycastle and White Park (R.Ll.P.), *B.N.F.C.*, 1892-3.

Derry—Dungiven, and near Limavady, Mrs. Leebody.

A. serpyllifolia L.

Down—Rockport and Downpatrick, R.Ll.P.

Antrim—Cushendall, Herb. D.M. Near Antrim, D. Redmond. Whitehead, Cushendall, Bushfoot, R.Ll.P.

Stellaria uliginosa Murr. Ascends to 2450 feet, S. & P.

Cerastium triviale Link. var. **β. C. holosteoides** Fries.

Derry—Abundant in meadows on the south side of the Bann below the railway bridge at Coleraine, Mrs. Leebody. A rare variety, not hitherto found in Ireland.

C. tetrandrum Curtis.

Down—Rostrevor and Killowen, S. & P. Kirkiston, C.H.W. Rockport, R.Ll.P.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.*, 1889-90. Cushendun, R.Ll.P.

Derry—Benbradagh, Mrs. Leebody.

Spergularia rubra (L.) Pers.

Down—Abundant on the shores of Lough Island Reavy, S. & P.

S. salina Presl.

Derry—Near Limavady Junction, Mrs. Leebody.

Scleranthus annuus L.

Down—Frequent in the Mourne district, S. & P.

Derry—Near Kilrea, R.Ll.P.

MALVACEÆ.

Malva moschata L.

Down—Loughbrickland, H.W.L., *I.N.*, 1893. Tullyveery near Saintfield, C.H.W. Between Dundonald and Comber, and near Tullymurry, R.Ll.P.

Antrim—Shane's Castle deer-park, Herb. D.M.

M. rotundifolia L.

Down—Frequent from Killowen to Seafield, S. & P.

Lavatera arborea L.

Antrim—"On the Shore at Ballantoy and grows also in the Sheep Island about ½ mile from the Ballantoy shore; Sept., 1797," R. Brown. Still grows on Sheep Island, S. A. Brenan. Summit of Stackaniskan, an isolated sea-stack at western end of Rathlin Island, R.Ll.P., *I.N.*, 1893.

We have no doubt that the plant is truly wild in these inaccessible maritime situations.

HYPERICACEÆ.

Hypericum androsæmum L.

Antrim—Cullybackey, Miss Knowles. Magheragall near Lisburn, Cairncastle, Cushendall, Fair Head, R.Ll.P.

Derry—Maghera, Kilrea, and Garvagh, R.Ll.P.

H. perforatum L.

Down—Near Newry, H.W.L. Tullymurry, R.Ll.P.

Antrim—Ram's Island, R.Ll.P.

Derry—Eglinton, Mrs. Leebody. Kilrea, R.Ll.P.

H. quadrangulum L. (Ex. p.). var. β **H. maculatum** Bab.

Down—By the Lagan Canal two miles above Lisburn, Richd. Hanna. Abundant by the Lagan Canal close to Lough Neagh, H.W.L. and C.H.W. Near Marino railway station, R.Ll.P.

Antrim—Glenmore near Lisburn (J. H. Davies), *B.N.F.C.* 1892-3.

H. humifusum L. To 800 feet in the Mournes, S. & P.

Down—Frequent in the Mournes, S. & P. Scrabo and Ballynahinch, R.Ll.P.

H. pulchrum L. To 2000 feet in the Mournes, S. & P.

H. elodes Huds. To 650 feet in the Mournes, S. & P.

Down—Several stations near Bryansford, Castlewellan, and Kilkeel, S. & P.

Derry—Ballyarnott race-course, Mrs. Leebody; S.A.S., *I.N.* 1894.

GERANIACEÆ.

[**Geranium striatum** L.

Down—Abundant in a lane near Comber, R.Ll.P.

Antrim—Near Ballinderry, W. D. Donnan.]

G. sylvaticum L. R.Ll.P. considers that Marino, where this plant grew (but suspiciously near a garden) until some ten years ago, was probably the "Holywood" station of *Flor. Ulst.*

The localities "Glenarm deerpark, and glen above Milltown at Cairncastle," given in *Flor. N.E.I.* for *G. pratense*, belong to *G. sylvaticum*. The range of these two plants in Antrim (and in Ireland) is thus seen to be very limited and well-defined, *G. sylvaticum* being confined to a few square miles in the vicinity of Glenarm, on the east coast of Antrim, while *G. pratense* is found along the north coast from Portrush to Ballycastle, a distance of some twenty miles.

G. pratense L. First found in Ireland by Templeton, not by Moore, as stated in *Flor. N.E.I.*

The Glenarm and Cairncastle stations of *Flora* are transferred to *G. sylvaticum*.

G. perenne Huds.

Down—Roadside near Castle Espie, C.H.W.

Antrim—Roadside near Whitewell quarries on Cave Hill, W. D. Donnan; R.Ll.P., *B.N.F.C.* 1892-3.

G. lucidum L.

Antrim—Torr Head, Herb. D.M. Glenariff, Shoolbred *I.N.* Antrim, W. S. Smith. Scawt Hill, and lake-shore west of Shane's Castle, R.Ll.P.

Erodium cicutarium L'Herit. 0—1200 feet.

Down—Abundant on the Mourne coast-line; also at Bryansford and Castlewellan, 2 and 4 miles from the sea, S. & P. Holywood Hills, in fields at 400 feet, R.Ll.P.

Antrim—Larne, Cushendun, White Park Bay, R.Ll.P.

Derry—Summit and base of Benevenagh cliffs, *B.N.F.C.* 1892-3. The plant grows here at an elevation of 800—1200 feet, associated with *Silene acaulis*, *S. maritima*, *Dryas octopetala*, *Salix herbacea*, and other alpines.

E. moschatum L'Herit.

Down—Annalong, Hart *R.I.A.*; and subsequently, S. & P. Waste ground south of Killough, Richd. Hanna; S.A.S., *I.N.* 1894.

Robert Brown, in the MS. referred to in the Introduction, notes this species as "growing abundantly at the west end of the suburbs of Londonderry, Sept. 29th, 1795," and "near Carrickfergus, July, 1797." It has not been found in either of these stations by any recent observer, and it seems probable that *E. cicutarium* was the plant seen.

E. maritimum L'Herit.

Down—Abundant at Ballykinler, R.Ll.P. Still at Kirkiston, C.H.W.

LINACEÆ.

Radiola linoides (L.) Gmel.

Down—Several places between Newcastle and Annalong, and at Causeway Water, S. & P.

Antrim—Abundant on Bushfoot sandhills, R.Ll.P.

CELASTRACEÆ.

Euonymus europæus L.

Down—Warrenpoint, Annalong, Newcastle, S. & P. Lough Leagh and Castle Espie, C.H.W. Near Ballynahinch, Richd. Hanna. Near Hillsborough, S.A.S. Clough and Killyleagh, R.Ll.P.

Antrim—Muckamore Glen (R.Ll.P.) *B.N.F.C.* 1893-4. Cullybackey, Miss Knowles. Rasharkin, S. A. Brenan.

RHAMNACEÆ.

Rhamnus catharticus L.

Antrim—Abundant on the shore of Lough Neagh at the place called the Selchin, Parish of Glenavy, Herb. D.M. This is another Lough Neagh record of a shrub that seems now quite lost through drainage.

Templeton notes this plant (MSS.) "in a hedge about 2 miles beyond Carrickfergus, June 30th, 1804." It may have been planted there, as it was formerly a notable plant, being much used medicinally. It has not been found there since.

R. frangula L.

Antrim—Bushy places near the River Main in Shane's Castle Park, Prof. R. O. Cunningham; R.Ll.P., *B.N.F.C.* 1890-1. The only recent record of this species.

LEGUMINOSÆ.

Ulex europæus L. Rises in the Mournes to 820 feet, Hart *R.I.A.*; to 800 feet, S. & P.

U. Gallii Planch. Upper limit in the Mournes 1600 feet, Hart *R.I.A.*; 1500 feet, S. & P.; at 1650 feet on Slieve Bearnagh, R.Ll.P.

Down—Aghaderg parish, H.W.L.

Sarothamnus scoparius L. To 800 feet in the Mournes, S. & P.

Ononis repens L.

Down—Sands east of Cranfield Point, S. & P. Margin of Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2. Field at Loughbrickland, H.W.L.

Derry—Benone at Magilligan, sparingly, Mrs. Leebody.

var. β **horrida** Lange.

Down—Sandy shore at Ardglass, C.H.W.

O. spinosa L. has not been re-found in Co. Down, and was, no doubt, a casual, S.A.S.

Medicago lupulina L.

Down—Common in the Mourne district, S. & P. Conlig, Ballykinler, Tullymurry, Killowen, R.Ll.P.

Antrim—Ballycastle, Redbay, Shane's Castle, Portmore, Whitehead, Cave Hill, R.Ll.P.

[**M. sativa** L.

Down—Fields at Cultra and Craigavad, R.Ll.P.]

[**Melilotus officinalis** Willd.

Antrim—Glenariff, Shoolbred *I.N.*]

M. arvensis W.

Antrim—Still abundant at several places between Kilroot and Larne, as it has been for the last 25 years, and may fairly be considered naturalized here.

[**M. parviflorus** Lam.

Antrim—Waste ground, Duncrue St., Belfast, R.Ll.P.]

Trifolium medium L.

Antrim—Throughout the county; many localities might be added.

Derry—Railway banks between Coleraine and Castlerock, R.Ll.P.

T. arvense L.

Down—Ballykinler sands, R.Ll.P.

Antrim—Carrickfergus, Cushendall, Ballycastle, Herb. D.M.

T. hybridum L. Frequent in sandy cultivated fields and waste ground, and thoroughly established as a colonist, S.A.S., *I.N.*, 1894.

Down and Antrim—Frequent.

Derry—Kilrea, and sandy fields at Bann mouth, R.Ll.P.

[**T. resupinatum** L.

Down—Saintfield, C.H.W.]

T. procumbens L.

Down—Frequent in Mourne district, S. & P. Shore-line below Holywood, and Ballykinler, R.Ll.P.

Antrim—Cushendall, Herb. D.M. Glenarm, R.Ll.P.

Derry—Eglinton, Mrs. Leebody.

Lotus corniculatus L. To 1200 feet in the Mournes, S. & P.

var. γ **L. crassifolius** Pers.

Derry—Rosses Bay on the Foyle, Mrs. Leebody.

L. pilosus Beeke. To 1150 feet in the Mournes, S. & P.

Down—Magheralin and Saintfield, C.H.W. Loughinisland, R.Ll.P.

Antrim—Glenariff, Shoolbred *I.N.* Ballymena, and plentiful at Racavan, Miss Knowles. Cushendun, S.A. Brenan. Mazetown, and Cairncastle, S.A.S. Rasharkin, R.Ll.P.

Derry—Frequent in North Derry; Mrs. Leebody. Kilrea, Garvagh, Maghera, and Coleraine, R.Ll.P.

Vica sylvatica L.

Down—Banks by the sea near Bloody Bridge, but not found elsewhere in Mourne district, S. & P. In a quarry by the railway north of Dundrum, plentiful, R.Ll.P.

Antrim—A var. with pure white flowers on limestone rocks between Larne and Glynn, Herb. D.M. Upper part of Colin Glen, and by the railway between Lambeg and Dunmurry, J. H. Davies. Glenariff, Shoolbred *I.N.* Altmore and Culraney, R.Ll.P.

V. orobus (L.) DC. Not found at Rostrevor (see *Raii Syn.* ed. II and *Flora N.E.I.*) by S. & P. Sherard's plant may have been *V. sylvatica*, which Templeton found there. The specimens in the Sherardian herbarium at Oxford do not settle the question.

V. sepium L. A white-flowered variety grows about Glenmore near Lisburn (J. H. Davies) and at Marino (R.Ll.P).

V. angustifolia Roth.

Down—Frequent in Mourne district, S. & P. Kirkiston, C.H.W. Greypoint and Killyleagh, R.Ll.P.

Antrim—Ballycastle and Cushendun, Herb. D.M. Whitehead and Rasharkin, R.Ll.P.

V. lathyroides L.

Down—Ballymacormick Point, R.Ll.P.

Antrim—Cushendun, S. A. Brenan.

Derry—Still at Magilligan, Mrs. Leebody.

Lathyrus macrorrhizus Wimm. To 1,000 feet in the Mournes, S. & P.
var. β. **L. tenuifolius** Roth.

Down—Rostrevor, S & P.

ROSACEÆ.

Prunus communis L. To 1,000 feet in the Mournes, S. & P.

P. insititia L. May fairly be considered as naturalized in the district.

P. padus L.

Antrim—Refound in Glenshesk, Shoolbred *I.N.*

P. avium L.

Derry—Walworth Wood near Londonderry, Mrs Leebody.

P. cerasus L.

Down—Crawfordsburn, Clandeboye demesne, and Annalong, R.Ll.P., *B.N.F.C.* 1890-1. Near Crossgar and Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.

Antrim—Near Carnmoney church, planted, S.A.S. Ballycastle, R.Ll.P., *B.N.F.C.* 1892-3. Glendun, and Rasharkin, R.Ll.P.

Derry—Near Draperstown, R.Ll.P., *B.N.F.C.* 1892-3.

Not unfrequent, and although no doubt planted in some of its stations, in others appears naturalized.

Sanguisorba officinalis L.

Down—Refound near Donaghadee, growing abundantly and luxuriantly on a railway bank, J H. Davies ; S.A.S., *I.N.* 1894.

Poterium sanguisorba L.

Antrim—Abundant in a meadow at Glenmore near Lisburn, J. H. Davies, *I.N.* 1892. The late Mr. More inclined to the view that it had been introduced in this station. It has continued abundant during the three years it has been under observation, but is apparently confined to one meadow. The geological formation is New Red Sandstone, but the Chalk is not far away.

Agrimonia eupatoria L.

Down—Killowen, S. & P. Anadroghal near Lough Neagh, H.W.L. and C.H.W. Near Greypoint, Ballykinler, and Tullymurry, R.Ll.P.

Antrim—Very frequent.

Derry—Kilrea and Magilligan, Mrs. Leebody.

A. odorata Mill.

Down—Roadside near Steamboat quay, Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.

Antrim—Glendun, Shoolbred *I.N.*

Alchemilla vulgaris L. To 1500 feet in the Mournes, S. & P.

var β **A. minor** Huds.

Down—Scrabo Hill, R.Ll.P.

Antrim—Binnagee near Carnlough, W. D. Donnan. Knockagh and Dunloy, R.Ll.P.

The recent paper by Rev. E. F. Linton on British forms of *Alchemilla vulgaris* (*Journ. Bot.*, April, 1895), and an examination of local specimens kindly made by that botanist, show that the above nomenclature needs revision. What was treated as type in *Flora* should now be quoted as var. *A. alpestris* Schmidt ; it is common in our district. The var. *A. minor* of *Flora* must now

be called var. *A. filicaulis* Buser; it is frequent on the basaltic plateau of Antrim and Derry. Restricted *A. vulgaris* L. (=*A. pratensis* Schmidt) probably occurs in our district also, but has not yet been separated.

Potentilla reptans L.

Down—Rostrevor, Killowen, and Newcastle, S. & P. Holywood and Millisle, R.Ll.P.

Antrim—Carrickfergus Junction, R.Ll.P.

P. tormentilla Sibth. var. β **P. procumbens** Sibth.

Down—Rostrevor and Newcastle, S. & P. Marino, R.Ll.P.; S.A.S., *I.N.* 1894.

Antrim—Glenariff, Glendun, and Glenshesk, Shoolbred *I.N.* Area in front of Belfast Museum, S.A.S., *I.N.* 1894.

Derry—Sandy fields at Bann mouth, and frequent in Kilrea district, R.Ll.P.

P. procumbens x tormentilla (*P. suberecta* Zimmeter).

Down—Newtownbreda, 1849, Dr. Mateer; E. S. Marshall, *Journ. Bot.* 1894, and W. H. Purchas, *ibid.*

Antrim—Glenshesk (*fide* Marshall), Shoolbred *I.N.*

Rubus idæus L. To 1,400 feet in the Mournes, S. & P.

R. suberectus Anders.

Down—Margin of Castlewellan Lake, S.A.S., *B.E.C. Report* 1893. This is the plant which is recorded as *R. ammobius* by S. & P., on the authority of Prof. Babington. Dr. Focke, the describer of the latter species, has examined our plant, and places it under *R. suberectus*.

R. plicatus W. & N.

Down—Aughnadarragh near Saintfield, C.H.W.

R. Rogersii Linton.

Down—Old bog in Saintfield demesne, and boggy ground by Aughnadarragh Lake near Saintfield, C.H.W.

R. nitidus W. & N.

Down—Margin of Altnadua Lake, S. & P. (as var. *hamulosus*, which Mr. Rogers remarks appears to be exactly typical *nitidus*).

R. carpinifolius W. & N.

Down—Newcastle and Moygannon Glen, S. & P. Loughbrickland, H.W.L.

R. Lindleianus Lees.

Down—Two stations in Aghaderg parish, H.W.L.

Antrim—Glenariff and Glendun, Shoolbred *I.N.*

Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. erythrinus Genev.

Derry—Ballinderry, S. A. Brenan, *Journ Bot.* 1895.

R. rhamnifolius W. & N. (Sp. collect.)

Down—Between Belfast and Holywood, J. Ball; W. O. Focke, *Journ. Bot.* 1891. Between Ballyvarley and Gilford, H.W.L. Castlewellan Park, S.A.S.

Antrim—Glenariff and Glendun, Shoolbred *I.N.* Cairncastle, S.A.S.

Derry—Magilligan, J. Ball; W. O. Focke, *Journ. Bot.* 1891.

S. A. Brenan's Ballinderry record in *Journ. Bot.* 1895 is doubtful.

R. nemoralis P. J. Muell. (Genev. *non* Bab.)

Down—By the White water at Donard Lodge, S. & P. (as *R. macrophyllus* var. *umbrosus* Arr.)

var. b. **glabratus** Bab.

Down—By Ghann River, S. & P. (as *R. macrophyllus* var. *glabratus* Bab.)

R. pulcherrimus Neum.

Down—Lisdalgan near Saintfield, C.H.W.; S.A.S., *I.N.* 1894. Ballintaggart in Aghaderg parish, H.W.L. By Castlewellan Lake, S.A.S.

Antrim—Cave Hill, Glenariff, Glendun, and between Cushendall and Knocknacarry, Shoolbred *I.N.*

Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. Muenteri Marss.

Antrim—Colin Glen, J. Ball; W. O. Focke, *Journ. Bot.* 1891.

Mr. Rogers considers that this form cannot as yet be included in British lists.

R. villicaulis Koehl.

Antrim—Glenariff and Glendun, Shoolbred *I.N.*

Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

var. b. **Selmeri** (Lindeb.)

Down—Saintfield, C.H.W., *I.N.* 1894. Between Scarva and Gilford, and at Dromorebreague in Aghaderg parish, H.W.L. Drumcro near Magheralin, C.H.W.

Antrim—Glendun, Shoolbred *I.N.*
Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. gratus Focke.
Antrim—Glendun, H.W.L.
Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. pubescens Weihe. (Sp. collect.)
Down—Carrickmannan near Saintfield, C.H.W.

R. silvaticus W. & N.
Down—Between Milltown and Clonallen, H.W.L. Saintfield, C.H.W.

R. macrophyllus W. & N.
Down--White Water, Altnadua Lake, and Tollymore Park, S. & P. Saintfield, C.H.W. Aghaderg parish and Hillsborough, H.W.L.
Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

var. b. **R. Schlechtendalii** (Weihe).
Down—Moygannon Glen, S. & P. Saintfield, C.H.W. Loughbrickland, H.W.L.

R. micans Gren. and Godr.
Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. pyramidalis Kalt.
Down—Tollymore Park and Donard Lodge, S. & P. Saintfield, C.H.W.
Antrim—Glenariff, Shoolbred *I.N.*

R. leucostachys Schleich.
Antrim—Cave Hill, near Larne, Glenariff, Shoolbred *I.N.*
Derry—Ballinderry, S A. Brenan, *Journ. Bot.* 1895.

R. mucronatus Blox.
Down—Saintfield, C.H.W.

R. Gelertii Frider var. b. **criniger** Linton.
Down—Aghaderg glebe at Loughbrickland, H.W.L.

R. Leyanus Rogers.
Down—Saintfield, C.H.W.; *Watson B.E.C.* 1893-4 (as *R. Drejeri*). "Very strong, and differing from the ordinary English plant."—W. M. Rogers.

R. radula Weihe.

Down—Aghaderg glebe at Loughbrickland, H.W.L.

Antrim—Hedgerows near Larne, Shoolbred *I.N.*

Derry—Ballinderry, S. A. Brenan, *Journ. Bot.* 1895.

R. echinatus Lindl.

Antrim—Cave Hill, Glenariff, Glendun, Shoolbred *I.N.*

R. rudis W. & N.

Down—Aghaderg glebe at Loughbrickland, H.W.L. "Hardly typical," W. M. Rogers.

R. scaber W. & N.

Down—Aghaderg glebe at Loughbrickland, H.W.L. S. A. Brenan's Ballinderry record in *Journ. Bot.* 1895 is omitted as doubtful.

R. fuscus W. & N.

Down—Two stations in Aghaderg parish, H.W.L.

R. rosaceus W. & N.

Down—Near Maralin, H.W.L. ("var. near *infecundus*," W. M. Rogers.)

var. b. **R. hystrix** (W. & N.)

Antrim—Glenariff, Shoolbred *I.N.*

R. Koehleri W. & N.

Down—Newcastle, S. & P.

Antrim—Glenariff and Glendun, Shoolbred *I.N.*

var. b. **R. pallidus** Bab.

Down—Tollymore Park, S. & P. Saintfield, C.H.W; S.A.S., *I.N.* 1894. Near Scarva and at Loughbrickland, H.W.L.

R. hirtus W. & K. var. c. **R. Kaltenbachii** Metsch.

Down—Ballintaggart in Aghaderg parish, H.W.L.

R. dumetorum W. & N.

Antrim—Cave Hill, and near Larne, Shoolbred *I.N.* Glendun, S. A. Brenan, *Journ. Bot.* 1895.

var. b. **R. diversifolius** (Lindl.)

Down—In Aghaderg parish, H.W.L.

R. corylifolius Sm. Ascends to 1400 feet in the Mournes, S. & P.

a. **R. sublustris** (Lees.) Common. Many localities might be added.
var. b. **R. conjungens** (Bab.)
Antrim—Near Larne, Shoolbred *I.N.*

R saxatilis L. 800-2000 feet in the Mournes, S. & P.
Down—Frequent on the Mourne Mountains, S. & P.
Antrim—Knockagh, in fine fruit (R.Ll.P.), *B.N.F.C.* 1892-3.
Derry—Heathy places near Kilrea, R.Ll.P.

R. chamæmorus L.
Derry—A small patch on the Derry side of the county boundary on the west side of Dart Mountain, H. C. Hart, *Journ. Bot.* 1892, and Hart and Barrington, *I.N.* 1892. A most interesting confirmation of Prof. Murphy's record (*Flora Hibernica*).

Geum intermedium Ehr.
Antrim—Near Muckamore, (R.Ll.P.), B.N.F.C. Excursion; *I.N.* 1893.

G. rivale L.
Down—Decidedly rare in the county. Absent from the Mourne district, S. & P. Only observed in the glen at Holywood Waterworks, R.Ll.P.

Rosa spinosissima L. To 2000 feet in the Mournes—a remarkable elevation, S. & P.
var. **R. ciphiana** Sibbald.
Derry—Magilligan, Mrs. Leebody.

R. hibernica Sm. var. b. **glabra**, Baker.
Down—Tillysburn, S.A.S. M. Crepin places the Tillysburn plant under this variety, adding "un peu pubescente." He considers *R hibernica* a hybrid—*R. pimpinellifolia* x *canina* = *spinosissima* x *canina*.

[**R. pomifera** Herm.
Antrim—Woods in Shane's Castle Park, S.A.S.]

R. involuta Sm.
Down—Mountain roads about Hilltown (aggregate), S. & P.
Antrim—Glendun ("form," W. M. Rogers), S. A. Brenan. Top of Colin Glen, *Flora Belfastiensis* (*R. Sabini*). This record was considered doubtful, but a specimen gathered there by S.A.S. in 1894 has been identified by M. Crepin.

var. *R. Sabini* Woods. The Braid Valley plant recorded in *I.N.*, 1894, p. 221 is not *R. Sabini*; nor can we be quite sure of the Hilltown plant of S. & P.

R. mollissima Willd.

Down—Near Dundrum, by the Quoile at Downpatrick, and at Ballynahinch, S.A.S.

Antrim—Waterloo near Larne (R.Ll.P.), *B.N.F.C.* 1890-1. Glendun and Glenshesk, Shoolbred *I.N.* Rasharkin, and between Ballymena and Broughshane, R.Ll.P.

Derry—Common near Kilrea weir, R.Ll.P.

R. tomentosa Smith. To 980 feet in the Mournes, S. & P.

var. d. **scabriuscula** Sm.

Antrim—Near Cushendall, Shoolbred *I.N.*

R. rubiginosa L.

Down—Hilltown, S.A.S. Near Comber and Downpatrick, R.Ll.P.

Antrim—Shane's Castle, Ram's Island, Dervock, Rasharkin, R.Ll.P.

Derry—Frequent in North Derry, Mrs. Leebody. Portglenone, R.Ll.P.

R. micrantha Smith. This species must be deleted from our flora. The Cushendun plant has been finally decided to be *R. rubiginosa*.

R. canina L., var. a. **lutetiana** (Leman).

Down—Comber, S.A.S.

Antrim—Common in the glens, Shoolbred *I.N.* Larne and Cairncastle, S.A.S.

var. e. **dumalis** (Bechst.)

Antrim—Common in the glens, Shoolbred *I.N.* Crumlin, Ballygilbert north of Cairncastle, and near Belfast, S.A.S.

var. j. **dumetorum** (Thuill.)

Down—Killowen, S.A.S.

Antrim—Mazetown, S.A.S.

var. n. **tomentella** (Leman).

Antrim—Colin Glen and Crow Glen, S.A.S.

var. w. **subcristata** Baker.

Antrim—Glendun, and sandy ground by the river in Glenshesk, Shoolbred *I.N.*

R. glauca Vill.

Antrim—Near Belfast, and Waterloo near Larne, S.A.S. Determined by M. Crepin.

R. arvensis Huds.

Down—South of Rostrevor, and near Bloody Bridge, S. & P. Between Crossgar and Killyleagh (R.Ll.P.), *B.N.F.C.* 1891-2. Rademon, Kilmore near Crossgar, and Saintfield, C.H.W. Loughinisland, R.Ll.P.

Antrim—Near Ballinderry, R.Ll.P.

var. c. **bibracteata** (Bast.).

Antrim—Hedgerow near Cushendun, Shoolbred *I.N.*

Cratægus oxyacantha L. To 1000 feet in the Mournes, S. & P.

Pyrus malus L.

Down—Frequent in Mourne district, doubtfully native, S. & P.

Antrim—Frequent about Stoneyford, R.Ll.P.

Derry—Bond's Glen, Mrs. Leebody. Upperlands and Kilrea, R.Ll.P.

P. aucuparia Gaert.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90.

P. aria (L.) Sm.

Antrim—Glendun, 1868, S. A. Brenan (type ! S.A.S.).

The specimen in Dr. Moore's Derry collection appears to be *P. rupicola*.

LYTHRACEÆ.

Peplis portula L. To 1150 feet in the Mournes, S. & P.

Down—Throughout the Mourne district, S. & P. Loughbrickland, H.W.L. Dundonald, R.Ll.P.

Derry—Enagh Lough, Mrs. Leebody.

ONAGRACEÆ.

Epilobium angustifolium L. To 1500 feet in the Mournes, S. & P.

Down—Cliffs of Eagle mountain, and cliffs south of Blue Lough, S. & P.

Antrim—Gobbins cliffs (R.Ll.P.), *B.N.F.C.* 1892-3. Scawt Hill, Carnlough, Parkmore, Altmore, Culraney, Dunseverick, R.Ll.P.

E. obscurum x palustre.

Antrim—Glenariff, Glenshesk, and Giant's Causeway, Shoolbred *I.N.* (*teste* E. S. Marshall).

E. palustre L. To 1150 feet in the Mournes, S. & P.

Down—Frequent in the Mourne district, S. & P. Sydenham, Dundonald, Conlig, Ballynahinch, and Narrow-water, R.Ll.P.

Antrim—Glenariff, Glendun, Fair Head, Shoolbred *I.N.* Bog Meadows, Killagan, Lough Naroon, Bushfoot, R.Ll.P.

Derry—Kilrea, Bannmouth, and Magilligan, R.Ll.P.

Circæa alpina L.

Down—Tollymore Park, S. & P.

Antrim—Langford Lodge, and still in Glenariff, R.Ll.P.

Derry—By the Roe near Limavady, Mrs. Leebody.

In addition to its native mountain habitats, it occurs frequently about Belfast as a garden weed—and a troublesome one too—as at Windsor Avenue, Cliftonville, several gardens at Holywood, and Clandeboye, R.Ll.P.

var. β **C. intermedia** Ehr.

Down—As a weed in a garden at Holywood, R.Ll.P.

Antrim—Glenariff and Glenshesk, Shoolbred *I.N.* Glendun, R.Ll.P.

HALORAGACEÆ.

Myriophyllum spicatum L.

Down—Abundant in Clandeboye Lakes, R.Ll.P.

Antrim—Abundant in Portmore Lough, R.Ll.P.

Derry and Antrim—In Lough Neagh at Toome, abundant in Lough Beg, and thence down the Bann to the sea, R.Ll.P.

Hippuris vulgaris L.

Down—Altnadua and Moneyscalp, S. & P. Pollramer Lake near Crossgar, C.H.W. Loughinisland and Killinchy, R.Ll.P.

Antrim—Between Ballycastle and White Park (R.Ll.P.), *B.N.F.C.* 1892-3. Portmore, H.W.L. Bog north of Ballymoney, R.Ll.P.

Derry—Bann mouth, R.Ll.P.

PORTULACEÆ.

Montia fontana L. To 2450 feet in the Mournes, S. & P.

CRASSULACEÆ.

Sedum rhodiola DC. 1000—2000 feet in the Mournes, S. & P.

Down—Pigeon Rock Mountain, and along the Slieve Muck ridge, S. & P.

Antrim—Abundant on the coast north of Torr, R.Ll.P.

S. telephium L.

Down—Dromantine, H.W.L. and C.H.W. Holywood Hills, Ballygowan, Downpatrick, R.Ll.P.

Antrim - Ballyclose and Craigbilly, Miss Knowles.

Derry—Near Maghera, R.Ll.P.

S. anglicum Huds. To 1000 feet in the Mournes, S. & P.

SAXIFRAGACEÆ.

Saxifraga stellaris L. To 2350 feet in the Mournes, Hart *R.I.A.*

Down—Not abundant on the Mournes, as stated by Templeton. It is abundant on the N.W. slopes of Donard and Commedagh, but elsewhere it was seen by S. & P. only sparingly on Cove Mountain and at Hare's Gap.

S. hypnoides L.

Derry—Benbradagh, Mrs. Leebody.

S. tridactylites L.

Down—On walls and gravel at Kilmore near Crossgar, and on rocks by the coast at Cloughey Bay, C.H.W.

Derry—Bellarena, Mrs. Leebody.

Chrysosplenium oppositifolium L. To 2450 feet in the Mournes, S. & P.

Parnassia palustris L.

Antrim—Roadside near Drumnasole, *B.N.F.C.* 1890-1. Carnlough, Altmore, Kinbane Head, R.Ll.P.

Derry—Mouth of the Roe, R.Ll.P.

UMBELLIFERÆ.

Hydrocotyle vulgaris L. To 1500 feet in the Mournes, S. & P.

Sanicula europæa L. To 1500 feet in the Mournes, S. & P.

Eryngium maritimum L.

Down—Very abundant from Greencastle Point to Nicholson's Point, S. & P.

Cicuta virosa L.

Down—By the Canal near Goraghwood, R.Ll.P.

Apium graveolans L.

Antrim—Redbay, Miss Knowles. Still occurs both north and south of Carrickfergus, S.A.S.

A. nodiflorum (L.) Reich. var. β *A. repens* (L.). Not now known in district 12, and was probably a misnomer.

A. inundatum Reich.

Down—Near Warrenpoint and Kilkeel, S. & P. Magheralin, and Pollramer Lake near Crossgar, C.H.W. Killinchy, Ballynahinch, Ballykinler, R.Ll P.

Antrim—Gawley's Gate on Lough Neagh, and by the Bann occasionally, R.Ll.P.

Derry—Lakes at Kilrea, and along the course of the Bann, R.Ll.P.

var. **Moorei** Syme.

Down—Marsh at Saul near Downpatrick, R.Ll.P.

Derry—By the Bann three miles below Kilrea, R.Ll.P.

Carum verticillatum Koch.

Antrim—The Crumlin record must be expunged; S.A.S is satisfied that it was an error.

Derry—It is immensely abundant at its Coleraine station, and extends down the Bann to the sandhills of the coast.

It cannot be found near Belfast, and the present range in our district of this rare Irish plant is thus seen to be very restricted, being confined to the meadows bordering the tidal portion of the Bann, and the headlands at Giant's Causeway.

[**C. carui** L.

Down—Holywood, R.Ll.P.

Antrim—Cushendun, S. A. Brenan. Carnlough, Portballantrae, Causeway, and on roadsides and heaths on Rathlin Island, R.Ll.P.]

[**Petroselinum sativum** Hoffm.

Down—Reagh Island in Strangford Lough, C.H.W. Walls of old castle at Ringhaddy, R.Ll.P.]

Pimpinella saxifraga L.

Antrim—Near Broughshane, Miss Knowles. Antrim and Rasharkin, R.Ll.P.

Sium erectum Huds.

Down—At a number of places near Downpatrick, and in Carrigullion Lake near Killinchy, R.Ll.P., *B.N.F.C.* 1892-3.

Œnanthe fistulosa L.

Antrim—Shores of Lough Beg, and thence to Coleraine occasionally, R.Ll.P.

Derry—Enagh Lough, Mrs. Leebody.

Œ. Lachenalii Gmel.

Down—Killowen, and mouth of Causeway water, S. & P.

Antrim—Shore at Giant's Causeway, R.Ll.P.

Œ. phellandrium L.

Down—Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2. Shore of Lough Neagh, C.H.W. Portavoe, Quoile River, Money Lake, R.Ll.P.

Derry—Magilligan, Mrs. Leebody.

Æthusa cynapium L.

Down—Warrenpoint, Rostrevor, and abundant at Killowen, S. & P. Saul, R.Ll.P.

Antrim—Brown's Bay on Islandmagee (R.Ll.P.) *B.N.F.C.* 1892-3. Crumlin Waterfoot, Miss Knowles. About Belfast, Whitehead, and Larne, R.Ll.P.

Derry—Coleraine, Mrs. Leebody. Upperlands. R.Ll.P.

Ligusticum scoticum L.

Antrim—Rocks on the shore at Bushfoot, R.Ll.P., and recently refound at Garron Point, S. A. Brenan; R.Ll.P., *B.N.F.C.* 1892-3.

Derry—Sparingly at Downhill, and still plentiful between Portrush and Portstewart, Mrs. Leebody.

Silaus pratensis (L.) Bess. Has not been refound, and was no doubt a casual.

Angelica sylvestris L. To 1500 feet in the Mournes, S. & P.

[**Peucedanum ostruthium** Koch.

Antrim—Stoneyford, R.Ll.P. Not now on Cave Hill, S.A.S.

Derry—Downhill, Mrs. Leebody.]

Pastinaca sativa L.

Down—Holywood and Dundrum, probably casual, R.Ll.P.

Antrim—By the new path to Cave Hill, casual, S.A.S.

Derry—Still abundant at Magilligan, and quite naturalized, R.Ll.P.

Heracleum sphondylium L. To 1,500 feet in the Mournes, S. & P.

Torilis nodosa (Huds.) Gaert.

Down—Abundant near Killowen, S. & P. Whiterock near Killinchy, C.H.W.

Antrim—Rathlin Island, R.Ll.P., *I.N.* 1893.

Scandix pecten-veneris L.

Down—Abundant at Killowen, S. & P. Killinchy (R.Ll.P.), *B.N.F.C.* 1890-1. Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2. Craigavad, Downpatrick, R.Ll.P.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-0. Carnlough, Dunseverick, Carrick-a-rede, Portballantrae, R.Ll.P.

Derry—Magilligan, Mrs. Leebody.

Chærophyllum anthriscus Lam.

Down—Killinchy (R.Ll.P.), *B.N.F.C.* 1890-1. Seashore at Ballyhornan Bay, very luxuriant, R.Ll.P.

Antrim—Still on the Curran at Larne, R.Ll.P.

Myrrhis odorata L.

Down—Roadside south of Spelga, S. & P. Near Saintfield and Kearney's Point, C.H.W. Loughbrickland and Annaclone, H.W.L. Holywood Hills, Crawfordsburn, &c., R.Ll.P.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90. Glendun, S. A. Brenan. Donegore, Dunadry, Stoneyford, Torr, Dunseverick, Giant's Causeway, R.Ll.P.

Conium maculatum L.

Antrim—At Portmore; rare inland, R.Ll.P.

Smyrnium olusatrum L.

Down—Frequent in Mourne district, S. & P. Knock and Downpatrick, R.Ll.P.

Antrim—Near Antrim, R.Ll.P.

Derry—Frequent in North Derry, Mrs. Leebody.

HEDERACEÆ.

Hedera helix L. To 2000 feet in the Mournes, S. & P.

CAPRIFOLIACEÆ

Sambucus ebulus L.

Down—Near Donaghmore, H.W.L. Near Ballynahinch, and still at Holywood, R.Ll.P.

Antrim—Dunadry and Cushendall, R.Ll.P.

Viburnum opulus L.

Down—Rostrevor, Altnadua Lake, and Tollymore Park, S. & P. Tullymurry, R.Ll.P.

Antrim—Near Slemish, C.H.W. & H.W.L. Clogh, H.W.L. Cullybackey, Miss Knowles. Ballinderry, Glenariff, Rasharkin, R.Ll.P.

Derry—Glen at Benevenagh, Mrs. Leebody. Kilrea and Garvagh, R.Ll.P.

Lonicera periclymenum L. To 2,000 feet in the Mournes, S. & P.

RUBIACEÆ.

Sherardia arvensis L.

Down—Frequent in the Mourne district, S. & P. Saintfield, and near Crossgar, C.H.W.

Antrim—Rasharkin, R.Ll.P.

Derry—Maghera, Kilrea, and Garvagh, R.Ll.P.

Galium boreale L.

Antrim—Among the rocks of Agnew's Hill 1804, Templeton MSS. Glenariff, Shoolbred *I.N.* Garron Point, between Ballymena and Broughshane, and by the river above Bushmills, R.Ll.P.

G. cruciatum (L.) With.

Down—Still plentiful on the side of Downpatrick rath, but no longer to be found at the Cathedral.

G. mollugo L.

Down—Lawn at Rowallen near Saintfield, D. Redmond; S.A.S., *I.N.* 1894.

Antrim—Riverside near Cullybackey, S. A. Brenan. Still at Glenarm Park, R.Ll.P.

Derry—Near Eglinton, Mrs. Leebody; H. C. Hart, *Journ. Bot.*, 1892.

VALERIANACEÆ.

Valeriana officinalis L. var. α **Mikanii** (Wats.)

Down—At 1500 feet on Slieve Muck, S. & P.

Antrim—Common in the Glens; the only form observed, Shoobred *I.N.* Sparingly by Lagan River at Mazetown, S.A.S.

var. β **V. sambucifolia** Mikan.

Down—Mourne Park and Tullybranagan, S. & P. Maxwell's Court near Comber, S.A.S.

Antrim—Plentiful by the Lagan at Mazetown, S.A.S.

Valerianella olitoria (L.) Moench.

Down—Frequent in the Mourne district, S. & P. Saintfield, C.H.W.

Antrim—Ballymena and Ballyclare, Miss Knowles. Larne, Scawt Hill, and abundant on chalk rocks on Garron Point, forming a close turf with *Saxifraga hypnoides* and *Hieracium anglicum*, R.Ll.P.

V. carinata Lois.

Down—Is increasing steadily at Dundonald, R.Ll.P.

V. dentata Willd.

Down—Maggie's Leap, Lisnacree, and abundant about Killowen and Seafield, S. & P. Killinchy (R.Ll.P.), *B.N.F.C.* 1890-1, and margins of Lough Leagh (R.Ll.P.), *B.N.F.C.* 1891-2.

DIPSACACEÆ.

Scabiosa succisa L. To 1900 feet in the Mournes, S. & P.

S. arvensis L.

Down—Frequent in the Mourne district, S. & P. Ballynahinch, R.Ll.P.

Antrim—About Ballymena, Miss Knowles.

Derry—Dungiven and Kilrea, Mrs. Leebody.

COMPOSITÆ.

Eupatorium cannabinum L.

Antrim—Lambeg, Templeton MSS. Ram's Island, Altmore, and Torr Head, R.Ll.P.

Derry—Cliffs at Downhill, R.Ll.P.

Petasites vulgaris L.

Down—Very rare in the Mourne district, S. & P. It is not generally common in the county, though abundant in Antrim.

P. fragrans L. Quite naturalized, and spreading throughout the district.

Tussilago farfara L. To 1900 feet in the Mournes, S. & P.

Erigeron acris L. The late Mr. A. G. More has informed us that this plant has been found on sandhills north of Newcastle; this is almost the same station as given in *Flora*, but is an interesting confirmation.

Solidago virgaurea L. To 2449 feet in the Mournes, S. & P.

var. β. **augustifolia** Koch.

Down—By the Bann above Hilltown, and abundant by the river in Tollymore Park, S. & P.

var. γ *S. cambrica* Huds. Not now in Tollymore Park, S. & P.; must be deleted from our flora.

Inula helenium L.

Down—Near Ballynahinch and Saul, R.Ll.P.

Antrim—Antrim, Carnlough, Portballantrae, Dunseverick, R.Ll.P.

Derry—Waste ground north of Kilrea, R.Ll.P.

Filago germanica (Huds.) L. To 500 feet in the Mournes, S. & P.

Down—Frequent in the Mourne district, S. & P. Loughinisland, R.Ll.P.

Antrim—Portrush, Bushfoot, Killagan, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

F. minima (Fries) Huds. To 500 feet in the Mournes, S. & P.

Gnaphalium sylvaticum L. To 800 feet in the Mournes, S. & P.

Down—Frequent in Mourne district, S. & P. Ballygowan, R.Ll.P.

Antrim—Glenariff, Shoolbred *I.N.* Near Ballymena, Miss Knowles. Scawt Hill, Culraney, Portrush, R.Ll.P.

Derry—Bellarena (R.Ll.P.), *B.N.F.C.* 1892-3. Kilrea and Upperlands, R.Ll.P.

Antennaria dioica (L.) R. Br.

Down—Kilbroney River, Slieve Muck, Slieve Meel-beg, S. & P.

Antrim—Clinty Hill near Ballymena, Miss Knowles. Killagan, C.H.W. Newtown Crommelin, S. A. Brenan. Pollan Burn, heaths west of Glenarm, Cushendall, Bushfoot, Rathlin Island, R.Ll.P.

Derry—Near Maghera and Garvagh, R.Ll.P.

[**Anthemis arvensis** L.

Down—Field at Glasdrumman, S. & P. Sandy field at Ballykinler, R.Ll.P.].

Matricaria inodora L. var. β **salina** Bab.

Antrim—Giant's Causeway, Shoolbred *I.N.*

var. **γ maritima** (L.).
Antrim—Redbay, Shoolbred *I.N.* 1894.

M. chamomilla L.
Down—Margin of Lough Island Reavy, probably casual, S. & P. Near Queen's Island, and on railway at Newry, R.Ll.P.
Antrim—Magheragall near Lisburn, and Ballygalley Head, R.Ll.P.
Increasing along the Antrim coast, and at least naturalized there ; perhaps only casual elsewhere.

Chrysanthemum segetum L. To 800 feet in the Mournes, S. & P. The name *Gilgowan*, applied by inadvertence to *C. leucanthemum* in *Flora*, pertains to this species.

Tanacetum vulgare L.
Down—Occasionally in the Mourne district, S. & P. Raholp old church, and Castle Island below Downpatrick, R.Ll.P.
Antrim—Glendun, S. A. Brenan. Dunadry, Glenariff, R.Ll.P.

Senecio sylvaticus L. To 800 feet in the Mournes, S. & P.
Down—Not rare in Mourne district, S. & P. Saintfield, C.H.W. Between Dromara and Banbridge, and near Goraghwood, H.W.L. Cotton Moss, Killinchy, Loughinisland, R.Ll.P.
Derry—Ballyscullion near Lough Beg, Mrs. Leebody. Castlerock, R.Ll.P.

[**S. saracenicus** L.
Down—Saintfield, C.H.W.
Derry—Near Culmore, Mrs. Leebody. Roadsides at Magilligan, R.Ll.P. Possibly naturalized].

Bidens tripartita L.
Down—By the Bann near Hilltown, S. & P. Brown bog near Loughbrickland, H.W.L. Saul and Crossgar, R.Ll.P.
Derry—Kilrea, R.Ll.P.

B. cernua L.
Down—Killowen, Lisnacree, and near Kilkeel and Newcastle, S. & P. Loughinisland, C.H.W. Brown Bog near Loughbrickland, H.W.L.
var. **radiata** Sond.
Down—Plentiful at Carrickmannan Lake, S.A.S., and in the Quoile marshes, R.Ll.P. ; S.A.S., *I.N.* 1894.

Saussurea alpina DC.

Down—Sparingly in fissures of dripping vertical slate rocks at 2000 feet on Slieve Muck North, S. & P. An interesting addition to the alpine plants of the district.

Arctium nemorosum Lej.

Down—Moygannon and Newcastle, S. & P. Ballykinler, Ballyhornan, and Ballyholme, S.A.S.

Antrim—Fair Head, Shoolbred *I.N.* Islandmagee and near Antrim, S.A.S.

A. intermedium Lange.

Down—Sandy waste at Benderg Bay, and by old road from Ballynahinch to Drumaness, S.A.S.

Antrim—Quarry at Ballygalley Head, S.A.S.

Derry—Magilligan, Mrs. Leebody.

A. minus Schkur.

Down—Benderg Bay and at Moygannon, S.A.S.

var. **majuscula** Hartm.

Antrim—Riverside at Crumlin, and at Bankheads near Larne, S.A.S. (*fide* Svante Murbeck).

The specimens so named by the eminent Swedish botanist seem to be almost identical with the *A. intermedium* Lange of Babington's Manual ed. 8.

Carduus crispus L. var. β. **C. acanthoides** L.

Down—Fields and waste ground at Killowen, S. & P.

Antrim—Refound at Larne by R.Ll.P.; S.A.S., *I.N.* 1894.

Derry—Still common at Magilligan; recently seen by R.Ll.P. at Bellarena (*B.N.F.C.* 1892-3) and about Magilligan station.

C. palustris L. To 1000 feet in the Mournes, S. & P.

C. pratensis Huds.

Down—Throughout the Kilbroney valley to 700 feet, sparingly by the Causeway Water, and by the Shimna near Newcastle, S. & P.

Antrim—Northern extremity of Lough Beg, Killagan, Dunloy, and Portballantrae, R.Ll.P.

Derry—Castlerock, Bran Lough above Maghera, near Garvagh, and by the Bann at Coleraine, R.Ll.P.

[**Silybum marianum** Gaert.
Down—Crawfordsburn, R.Ll.P.
Antrim—White Park Bay, R.Ll.P.]

[**Onopordum acanthium** L.
Antrim—Waste ground near a cottage at Ballygalley Head, S.A.S. and R.Ll.P., 1887. A casual since lost.]

Cichorium intybus L.
Down—Cornfield near Kilkeel, casual, S. & P. Uncultivated ground at Lisnatrunk, J. H. Davies. Saintfield, and quarry bank at Magheralin, C.H.W.
Antrim—Broughshane, Herb. Canon Grainger. Glynn, and Portrush sandhills, casual, R.Ll.P.
R.Ll.P. considers that this plant is only a casual in the district.

Leontodon hirtus L.
Down—Fields by the sea at Dalchoolin near Craigavad, R.Ll.P., *B.N.F.C.* 1892-3. Lawn at Narrow-water Castle (R.Ll.P.), B.N.F.C. Excursion, *I.N.* 1893.

L. hispidum L. The specimen which apparently represents this species in Dr. Moore's set of Derry plants in Dublin Museum is a hispid form of *L. autumnale*, and as the species has not been found by any other botanist on the well-searched fields of Magilligan, its right to a place in our flora is very doubtful.

L. autumnalis L. To 2310 feet in the Mournes, Hart *R.I.A.*

L. taraxacum L. To 1000 feet in the Mournes, S. & P.

var. δ. **L. palustre** Smith.
Antrim—Cushendun, R.Ll.P.

Tragopogon porrifolius L. Is still abundant at Macedon, Sydenham, and Knock, and has spread to railway bank at the Kinnegar at Holywood, where it has been abundant for the last two years (R.Ll.P.); may fairly be considered naturalized in the district.

Crepis biennis L.
Down—Meadows between Crossgar and Downpatrick, R.Ll.P. Is still steadily increasing in the district, and may rank as naturalised.

C. virens L. To 1200 feet in the Mournes, S. & P.

C. paludosa (L.) Moench.

Down—Ballymacormick Point, a few feet above sea-level, R.Ll.P.

Antrim—Stoneyford, Shane's Castle, and abundant in the glens along the coast, R.Ll.P.

Derry—By the Roe, Mrs. Leebody. Kilrea and Garvagh, R.Ll.P.

Hieracium anglicum Fr. 200-2000 feet in the Mournes, S. & P.

Down—The most abundant hawkweed in the Mournes, S. & P.

Antrim—Fair Head and Giant's Causeway, Shoolbred *I.N.* Rocks north of Ballycastle, S.A.S.

var. b. **acutifolium** Backh.

Down—Luke's Mountain at 1000 feet, and by the Shimna River above Tollymore Park, S. & P.

var. d. **longibracteatum** Hanb.

Antrim—Garron Point and Glenariff, W. A. Shoolbred; S.A S., *I.N.* 1894.

H. iricum Fr.

Derry—Basaltic cliffs, Downhill, R.Ll.P.

H. flocculosum Backh.

Down—By Spinkwee River at 800 feet (not 1500 feet, as given in *Flora*), and by the same stream on shady rocks in Tollymore Park, S. & P.

Antrim—Sallagh Braes, S.A.S.

H. Leyi Hanb.

Antrim—Benevenagh, W. A. Shoolbred; S.A.S., *I.N.* 1894 (as *H. bifidum* Tausch).

H. Schmidtii Tausch.

Down—Granite cliffs of Bencrom, S. & P.

The Antrim and Derry localities, published in *Flora* for *H. pallidum*, have been mostly transferred to *H. euprepes*; the remainder are doubtful.

H. lasiophyllum Koch. The Ballycastle record has been transferred to *H. anglicum*.

H. Farrense Hanb.

Antrim—Sallagh Braes, S.A.S.; R.Ll.P., *B.N.F.C.* 1892-3.

H. rubicundum Hanb.

Antrim—Sallagh Braes, S.A.S.; R.Ll.P., *B.N.F.C.* 1892-3.

H. argenteum Fr. 100-1700 feet in the Mournes, S. & P.

Down—Cove Mountain, Bencrom, Slieve Donard, and Tollymore Park, S. & P.

The *H. argenteum* of *Flora* is transferred to *H. hibernicum*.

H. Sommerfeltii Lindeb.

Derry—Benevenagh, S.A.S.

H. hibernicum Hanb.

Down—Mountain stream in the Mourne Mountains near Rostrevor, H. C. Hart. *Journ. Bot.* 1886 (as *H. argenteum* Fr.). Refound on rocks at Broughnamaddy (the same station), S. & P.

H. stenolepis Lindeb.

Antrim—Cave Hill, R.Ll.P., and plentiful on Knockagh and Sallagh Braes, S.A.S.; R.Ll.P., *B.N.F.C.* 1890-1. Garron Point, W. A. Shoolbred; S.A.S., *I.N.* 1894. Glenariff, Shoolbred *I.N.*

Derry—Benevenagh, Shoolbred *I.N.*

H. murorum L. pt.

Down—Very rare in the Mournes; found only by the Bann, S. & P.

Antrim—Garron Point, Shoolbred *I.N.*

var. m. **pachyphyllum** Purchas.

Antrim—Basaltic cliffs of Knockagh and Sallagh Braes, S.A.S.; W. H. Purchas, *Journ. Bot.* 1895.

H. euprepes Hanb.

Antrim—Cave Hill, Dr. Mateer, 1845, Herb. Hanbury. Sallagh Braes, S.A.S.; R.Ll.P., *B.N.F.C.* 1892-3. Bank at Milltown near Red Bay, W. A. Shoolbred; S.A.S., *I.N.* 1894.

Derry—Benevenagh, S.A.S.

H. cæsium Fr.

Antrim—Glenariff (S.A.S.), *B.N.F.C.* 1889-90.

H. vulgatum Fr.

Down—Blue Lough, Hare's Gap, Slieve Muck North, S. & P.

H. sciaphilum Uecht.

Down—Saintfield, D. Redmond.

H. gothicum (Fr. pt.) Backh. (*H. Friesii* Hartm.).

Antrim—Riverbanks in Glendun, Shoolbred *I.N.*

var. **Stewartii** Hanb. 350-950 feet, S. & P.

Down—Several spots by the Bann above Hilltown, and sparingly in Tollymore Park, S. & P. (as *H. Friesii*, Hartm.). It grows along the course of the Bann for about three miles.

H. corymbosum Fr.

Antrim—Riverbanks in Glendun, Shoolbred *I N.*

H. auratum Fries. 150-1500 feet in the Mournes, S. & P.

Down—The most abundant accipitrine Hawkweed in the Mournes, S. & P.

Antrim—Lough Neagh shore at Cranfield, S.A.S., and sea-cliffs at Cushendun, R.Ll.P.; R.Ll.P., *B.N.F.C.* 1892-3. Several places in Glendun, Shoolbred *I.N.*

H. crocatum Fr.

Down—By the Shimna River, and on Pigeon Rock Mountain, S. & P.

Antrim—Milltown near Redbay, and Glendun, Shoolbred *I.N.*

H. boreale Fr.

Down—Abundant by the Shimna River above Tollymore Park, S. & P. (as *H. commutatum*, Beck.).

CAMPANULACEÆ.

Lobelia Dortmanna L. 330-1350 feet in the Mournes, S. & P. There is no lake at 1500 feet, the elevation given by Hart, *R.I.A.*

Down—Lough Shannagh and Altnadua Lake, S. & P.

Antrim—Abundant in a lakelet on summit of Binnagee near Carnlough, at 1000 feet, R.Ll.P., *B.N.F.C.* 1890-1.

Jasione montana L. To 1500 feet in the Mournes, S. & P.

Campanula rapunculoides L.

Down—Fields near Rostrevor and north of Newcastle, S. & P.

Antrim—In a sandpit near Broughshane, R.Ll.P.

Derry—Common in a field near Kilrea, R.Ll.P.

Has persisted in the sandy land near Newcastle for over 20 years, and is naturalized at least here.

C. rotundifolia L. To 2450 feet on the Mournes, Hart *R.I.A.*

ERICACEÆ.

Arctostaphylos uva-ursi (L.) Spreng. Dr. Dickie's Slieve Donard plant was no doubt *Vaccinium vitis-idæa*, S. & P.

Erica tetralix L. To 2055 feet on the Mournes, S. & P.

E. cinerea L. To 2440 feet on the Mournes, S. & P.

Vaccinium vitis-idæa L. 1500-2796 feet on the Mournes, S. & P. 200-2000 feet in Derry.

Down—On most of the Mourne summits, S. & P.

Antrim—Among the rocks of Agnew's Hill, 1804, Templeton MSS. Head of Glenariff, S. A. Brenan. Near Cranny Lough west of Carnlough, R.Ll.P.

Derry—Bank by the roadside between Kilrea and Garvagh, at 200 feet elevation, R.Ll.P., *Journ. Bot.* 1894. Summit of Mullaghclogher, R.Ll.P.

V. oxycoccos L.

Down—Marsh at Saul Camp near Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.

Antrim—Lakelet N.W. of Carnlough, at 1000 feet, R.Ll.P., *B.N.F.C.* 1892-3 Evish above Glenariff, S. A. Brenan. Abundant on the extensive bogs above Dunloy and Rasharkin, R.Ll.P.

Derry—Bog on margin of Lough Ouske in the Sperrin Mountains, R.Ll.P., *B.N.F.C.* 1892-3.

Pyrola media Swartz.

Down—Still abundant on Conlig Hill.

Antrim—Near Cairn Hill and Irish Hill, W. Macmillan. Rocky thicket between Kilrea and Garvagh, Miss Knowles.

P. minor L.

Down—Between the Barbican gate and the sawmill in Tollymore Park, H.W.L.

Antrim—Refound in Glenariff, S. A. Brenan.

P. secunda L. Though carefully searched for at Errigal Banks by Mrs. Leebody, Miss Knowles, and R.Ll.P., this rare plant has not been refound, though *P. media* and *P. minor*, recorded from the same place by Dr. Moore, are still abundant there. Neither has it been refound in any of the other stations given by Dr. Moore; yet the specimens (or rather some of them) preserved in Dr. Moore's herbarium are undoubtedly *P. secunda*.

AQUIFOLIACEÆ.

Ilex aquifolium L. To 1050 feet in the Mournes, Hart *R.I.A.*

OLEACEÆ.

Fraxinus excelsior L. To 1000 feet in the Mournes, S. & P.

GENTIANACEÆ.

Erythræa centaurium (Curt.) Pers. var. b. **capitata** (Koch).

Antrim—Sand-banks near Giant's Causeway, Shoolbred *I.N.*

Gentiana amarella L. The specimen which apparently represents this species in Dr. Moore's Derry herbarium is *G. campestris*. *G. amarella* has not been found in the district by any recent botanist.

G. campestris L.

Down—Spelga Mountain near Rostrevor, and by the Causeway water, S. & P. Ballykinler, and still on the Kinnegar at Holywood, R.Ll.P.

Antrim—Frequent throughout the county. Many localities might be added to the list already published.

Derry—Eskers south of Kilrea, R.Ll.P.

Menyanthes trifoliata L. To 1600 feet in the Mournes, S. & P.

CONVOLVULACEÆ.

Convolvulus arvensis L.

Down—Rostrevor, Killowen, Kilkeel, Newcastle, S. & P. Killough Bay (R.Ll.P.) *B.N.F.C.* 1892-3. Abundant on the coast near Millisle, J. H. Davies. Queen's Island, Newtownards, Ballydugan Lake, R.Ll.P.

Antrim—Along the railway from Belfast to Larne, where it has come with ballast, which is obtained on the Curran, where the plant grows abundantly, R.Ll.P.

Derry—Ballykelly, Mrs. Leebody. Bann mouth and Limavady Junction, R.Ll.P.

BORAGINACEÆ.

Cynoglossum officinale L.

Down—Abundant on shore at Killowen, rising to 500 feet on the adjoining stony slopes of Spelga Mountain, S. & P.

[**Borago officinalis** L.
Antrim—Sandhills at White Park Bay, away from any houses, W. J. Knowles.]

Anchusa sempervirens L.
Down—Between Dundonald and Comber, R.Ll.P.
Antrim—Ballyrobert, Parish of Shankill, Herb. D.M. Cullybackey, probably escaped, Miss Knowles. Oldstone near Antrim, W. S. Smith.

Symphytum officinale L.
Down—Near Hilltown and Newcastle, S. & P. Queen's Island, Knocknagoney, Ballynahinch, R.Ll.P.
Antrim—Portrush, Dunseverick, and about Portballantrae, R.Ll.P.
Derry—Magilligan, Mrs. Leebody. Kilrea, R.Ll.P.

S. tuberosum L. Rev. G. Robinson's station is among the woods close to Clandeboye House, where the plant grows abundantly, and appears quite naturalized, though it probably originated in the garden there, R.Ll.P.

Echium vulgare L.
Down—Abundant in a field near Wood House, Rostrevor, S. & P. Kirkiston, C.H.W. On the railway at Ballymacarrett Junction, casual, R.Ll.P.
Antrim—Magheramorne, probably casual, R.Ll.P.

Mertensia maritima (L.) Don.
Down—Extending for nearly a mile along the shingly beach at Glasdrumman south of Newcastle, S. & P. This is Templeton's station.
Derry—Between Portrush and Portstewart, Mrs. Leebody.

This last is the locality mentioned by Sampson (*Statistical Survey of the County of Londonderry*, 1802) when he speaks of the "oyster plant" as growing "on the shore at Ballyaghran . . . . on the gravel, close to the sea" and is an interesting confirmation of an old record not mentioned in *Flora*.

Lithospermum arvense L.
Antrim—Brickfield near Saltwater Bridge, Belfast, Dr. J. L. Drummond, 1820; Belfast Museum Herb. This station is long since built over, and become part of the city.

Myosotis palustris With.
Down—Near Rostrevor and Newcastle, rare in the Mournes, S. & P. Ballynahinch and Loughinisland, R.Ll.P.

Antrim—Bush River and Crumlin Waterfoot, R.Ll.P.

The Slieve Donard station of *Flora* belongs to *M. repens.*

var. b. **strigulosa** Reichb.

Antrim—Cushendun, Shoolbred *I.N.*

M. repens Don. To 1000 feet in the Mournes, S. & P.

Down—Abundant on the flanks of the mountains and low grounds of Mourne, S. & P. Crossgar, R.Ll.P.

Derry—Near Upperlands, R.Ll.P.

M. collina Hoffm.

Down—Kirkiston, C.H.W.

Antrim—Gravelly banks at mouth of Sixmile River, R.Ll.P., *B.N.F.C.* 1892-3.

Derry—Portstewart, Miss Davies, *B.N.F.C.* 1889-90.

SOLANACEÆ.

Solanum dulcamara L.

Down—Glasdrumman near Annalong, S. & P. Hedges between Killough and Ardglass, C.H.W. Grey Point and Ballynahinch, R.Ll.P.

Antrim—Ballycastle, R. Welch. Near Ballymena, Miss Knowles.

Derry—Dungiven, and by the Foyle, Mrs. Leebody.

Hyoscyamus niger L.

Down—Plentiful on distillery rubbish at Comber, imported with seed, S.A.S., *I.N.* 1894.

Antrim—A few plants at Glenmore near Lisburn in 1890, but not found since, J. H. Davies. Carnlough, casual, Rev. J. Hall. Still about Ballycastle, R.Ll.P.

OROBANCHACEÆ.

Orobanche rubra Sm.

Antrim—"Gathered near Ballycastle, Oct. 1797," R. Brown (as *O. major*). Kinbane Head, R.Ll.P.

Derry—Castlerock, R.Ll.P.

[**O. minor** Sm.

Down—Abundant in a field by the sea at Craigavad, 1892, H. C. Marshall; R.Ll.P., *B.N.F.C.* 1892-3. Also in 1893, H. C. Marshall. No doubt introduced with seed, along with the Lucerne on which it grows, but in view of the spread of this species in Ireland, its behaviour should be watched.]

Lathræa squamaria L.

Antrim—At Whitehall near Broughshane, on Plum, S. A. Brenan.

Derry—Bellarena, Mrs. Leebody.

SCROPHULARIACEÆ.

Verbascum thapsus L.

Down—Stony beach north of Killowen, S. & P. Disused gravel-pit near Lambeg, J. H. Davies. Hillsborough demesne, and on walls and waste ground at Downpatrick, R.Ll.P.

Antrim—Shore of Lough Neagh in Glenavy Parish, Herb. D. M.

Derry—Dungiven and Limavady, Mrs. Leebody.

[**Erinus alpinus** L.

Down—Growing freely on the wall of the gaol at Downpatrick, 1890, R.Ll.P., *B.N.F.C.* 1892-93; and still there. A south European plant, now established in the North of England, but apparently not previously noticed in Ireland.]

Digitalis purpurea L. To 1400 feet in the Mournes, S. & P.

Linaria repens Ait.

Down—Abundantly in fields, on banks, by roadsides, and seashore at Killowen, and thence to Seafield; first noticed here by R.Ll.P. in June, 1884, S. & P.

L. vulgaris Mill.

Down—Crossgar, Killyleagh, Loughinisland, Killinchy, Newry, R.Ll.P.

Antrim—Ram's Island, Broughshane, Dunloy, Dervock, Ballycastle, R.Ll.P. Near Doagh, Rev. W. S. Smith.

The Killowen record under this name belongs to *L. repens*.

Scrophularia aquatica L.

Between Warrenpoint Church and Gasworks, S. & P. Sparingly b Castlewellan Lake, S.A.S.

Derry—By the Bann at Coleraine, Mrs. Leebody. Dr. Moore's note "Very common in the county" is certainly an error; the above is the only station we know of.

Melampyrum pratense L. 100-1400 feet in the Mournes, S. & P.

Down—Sparingly on cliffs of Eagle Mountain, S. & P. The Mourne records of *Flora* probably belong to var. *montanum*, excepting Tollymore Park, where the type grows abundantly.

Antrim—Shane's Castle, W. D. Donnan. Runabay Head, Carnlough, rocks near Lough Naroon, and heath above Rasharkin, R.Ll.P.

Derry—Bog near Portglenone, Miss Knowles. Wood near Kilrea, R.Ll.P.

var. b. **latifolium** Syme.

Antrim—In the glens, Shoolbred *I.N.*

var. c. **M. montanum** Johnst. 1400-2394 feet in the Mournes, S. & P.

Down—Many places in the Mournes, S. & P.

Antrim—In the glens, Shoolbred *I.N.* On Knocklayd at 1500 feet, R.Ll.P.

M. sylvaticum L.

Antrim—Glenoe, 1837, Herb. D.M.

Thompson's Tollymore Park plant was no doubt a form of *M. pratense*, S. & P.

Mimulus luteus L.

Down—Edge of Clandeboye Lake, R.Ll.P.

Thoroughly naturalized in the district.

Rhinanthus crista-galli L. To 1000 feet in the Mournes, S. & P. 1690 feet in Antrim (summit of Knocklayd), R.Ll.P.

Bartsia odontites Huds. var. b. **serotina** (Reichb.)

Antrim—Giant's Causeway, Shoolbred *I.N.*

Euphrasia officinalis L. To 2300 feet in the Mournes, S. & P.

var. b. **E. gracilis**, Fries.

Down—By Bloody Bridge River, S.A.S.

Antrim—Between Ballyearth and Ballintoy, Shoolbred *I.N.* Basalt debris on Knockagh, S.A.S.

Veronica scutellata L.

Down—A number of stations in the Mournes, S. & P. Magheralin, C.H.W. Dundonald, Conlig, Downpatrick, R.Ll.P.

Antrim—Refound on Rathlin, R.Ll.P., *B.N.F.C.* 1889-90. Ballycastle, Killagan, above Lisburn, and near Scawt Hill, R.Ll.P.

Derry—Enagh Lough, Mrs. Leebody. Kilrea, R.Ll.P.

V. anagallis L.

Down—Lisnacree, Narrow-water, White Water, S. & P. Ballynahinch, C.H.W. Newtownards and Killinchy, R.Ll.P.

Antrim—Lisburn, Stoneyford, Doagh, Crumlin, Shane's Castle, R.Ll.P.

Derry—Bellarena, Mrs. Leebody. Coleraine, R.Ll.P.

V. montana L.
Down—Saintfield, C.H.W. Downpatrick, R.Ll.P.
Antrim—Glendun, S. A. Brenan. Shaw's Bridge, Langford Lodge, Bushmills, R.Ll.P.
Derry—Bellarena and Prehen, Mrs. Leebody. Kilrea, R.Ll.P.

V. serpyllifolia L. To 1000 feet in the Mournes, S. & P.

V. polita Fr.
Down—Frequent in Mourne district, S. & P. Cultra, R.Ll.P.
Antrim—Bushmills, S.A.S., *I.N.* 1894.
Derry—Coleraine, Mrs. Leebody. Kilrea and Castlerock, R.Ll.P.

V. Buxbaumii Ten.
Down—Rostrevor, Killowen, Greencastle, S. & P. Dundrum, C.H.W. Kilmore near Crossgar, H.W.L. Millisle, R.Ll.P.
Antrim—Ballymena and Glenariff, Miss Knowles. Rathlin Island, R.Ll.P., *I.N.* 1893.

V. hederifolia L.
Down—Killowen, S. & P. Saul and Newcastle, C.H.W. Craigavad, W. D. Donnan.
Antrim—Rathlin Island, R.Ll.P., *I.N.* 1893. Stoneyford and Islandmagee, R.Ll.P.

LABIATÆ.

[**Mentha viridis** L.
Down—Stream by roadside at Saul, C.H.W.]

[**M. rotundifolia** L.
Down—River-side near Ballynahinch, Richd. Hanna. Near Saul Chapel, and between Newtownards and Comber, R.Ll.P.]

[**M. alopecuroides** Hull.
Down—Stream by roadside at Saul, C.H.W., *Watson B.E.C.* 1893.]

M. piperita Huds.
Down—Plentiful by the old road between Ballynahinch and Drumaness, Richd. Hanna.

M. sativa L. var. β. **M. rubra** Huds.
Down—Saintfield, C.H.W.

var. **paludosa** (Sole).

Derry—Limavady Junction, Mrs. Leebody; S.A.S., *I.N.* 1894.

M. pulegium L.

Antrim—Abundant in a damp meadow near the north end of Lough Beg, Miss Knowles and R.Ll.P.

Not now to be found at foot of Tullybranagan Mountain, Down (*Ir. Flor.*), S. & P.

Lycopus europæus L.

Down—Annalong, and Narrow-water demesne, S. & P. Near Crossgar, C.H.W. Portavoe and Killinchy, R.Ll.P. By Ballyward Lake, S.A.S.

Derry—Upperlands, Kilrea, and near Portglenone, R.Ll.P.

Origanum vulgare L.

Down—Walls of Templepatrick graveyard, Richd. Hanna.

Derry—Eglinton, Mrs. Leebody.

Thymus serpyllum L. To 2050 feet in the Mournes, Hart *R.I.A.* To 2000 feet, S. & P.

Scutellaria galericulata L.

Down—By canal south of Scarva, H.W.L. and C.H.W. Loughinisland, R.Ll.P.

Antrim—Glenmore near Lisburn, J. H. Davies. Cushendun, S. A. Brenan. Roadside near Rasharkin, Miss Knowles. Langford Lodge, R.Ll.P.

Nepeta cataria L.

Down—Abundant by a roadside at Cloughey Bay, C.H.W.

Lamium amplexicaule L.

Down—Kilbroney, Killowen, Knockshee, Greencastle, Annalong, S. & P. Killough Bay (R.Ll.P.), *B.N.F.C.* 1892-3. Rough Island, Ballywater, Ballykinler, R.Ll.P.

Antrim—Stoneyford, Broughshane, R.Ll.P.

Derry—Dungiven, Mrs. Leebody.

L. intermedium Fries. Throughout Down and Antrim. Numerous further stations might be quoted.

L. hybridum Villars.

Down—Killowen, and Glasdrumman near Annalong, S. & P.

Antrim—Carnlough, R.Ll.P.

L. album L.

Down—Kilmore near Crossgar, C.H.W. Loughbrickland, H.W.L. Narrow-water, R.Ll.P.

Antrim—Broughshane, S. A. Brenan. Magheramorne, R.Ll.P.

Galeopsis speciosa Mill.

Down—Annalong, Hart *R.I.A.* Field at Six-road-ends near Conlig, S.A.S., *I.N.* 1894.

Antrim—Frequent in sandy cornfields in the neighbourhood of Cushendall, July, 1836, Herb. D. M. Still at Cushendall, R.Ll.P., *B.N.F.C.* 1890-91. Glenariff, Ardclinis, and Cushendun, R.Ll.P., *B.N.F.C.* 1892-3. Breckagh in parish of Skerry, S. A. Brenan.

Derry—Eglinton, and near Enagh Lough, Mrs. Leebody. Half way between Kilrea and Maghera, R.Ll.P.

Stachys betonica (L.) Benth.

Derry—Refound at Kilrea by Mrs. Leebody; S.A.S., *I.N.* 1894. It grows here in some abundance in several pasture fields between the weir and the bridge, R.Ll.P.

S. sylvatica x palustris.

Down—Struell wells near Downpatrick, R.Ll.P.

Antrim—Islandmagee, Herb. D. M. Roadside bank near Belfast, S.A.S., *B.E.C. Report* 1889. Carnlough, and Magheragall near Lisburn, R.Ll.P.

Hybrids nearer *palustris* than *sylvatica* are the prevailing forms in the district. The only station we know for true *S. ambigua* Smith is that of S.A.S. given above, which is near Glenville, on the road from Hannahstown to Woodburne.

S. arvensis L.

Down—In some abundance from Newcastle to Kilkeel, and very abundant at Killowen, S. & P. Fields by shore south of Killough, and between Castlewellan and the Factory, S.A.S. Saul, R.Ll.P.

Antrim—Broughshane, and west base of Knocklayd, R.Ll.P.

Ballota alba L.

Down—Near Warrenpoint, S. & P. Ballynahinch, and Ballykinler, R.Ll.P.

Antrim—Near Moira, 1837, Herb. D. M. Brown's Bay on Islandmagee, (R.Ll.P.) *B.N.F.C.* 1892-3. Cushendun, S. A. Brenan. Ballycastle and Bushmills, R.Ll.P.

Teucrium scorodonia L. To 1400 feet in the Mournes, S. & P.

VERBENACEÆ.

[**Verbena officinalis** L.

Down—Roadside about a mile from Pointzpass on the way to Loughbrickland, H.W.L.; R.Ll.P., *B.N.F.C.* 1892-93.; and still there, H.W.L.]

LENTIBULARIACEÆ.

Pinguicula vulgaris L. To 2000 feet in the Mournes, S. & P.

P. lusitanica L. 0-1600 in the Mournes, S. & P.

Down—A number of stations in the Mournes, S. & P.

Antrim—On moist banks near the Giant's Causeway, Herb. D. M. Glendun, S. A. Brenan. Margins of Lough Naroon, Miss Knowles and R.Ll.P. Cushendall, R.Ll.P.

Derry—"Gathered on a bog by the roadside about half way between Londonderry and Newtownlimavady, Aug. 6th, 1795," R. Brown. Bran Lough above Maghera, R.Ll.P.

Utricularia vulgaris L.

Down—Altnadua Lake, and site of Moneyscalp Lake, S. & P. Brown Bog near Loughbrickland, H.W.L. Lake near Helen's Tower, R.Ll.P.

Antrim—Very fine in clayey holes below the Asylum, Belfast, 1837, Herb. D.M. Portmore, R.Ll.P.

Derry—Lakelets near Kilrea, R.Ll.P.

U. intermedia Hayne.

Antrim—On a large peat-bog near Rasharkin, D.M.; *Cybele Hibernica.* Abundant and fine in a boggy pool about a mile west of Lough Naroon, R.Ll.P.

U. minor L.

Down—Anahilt bog, and bog near the head of Kilkeel River [still there, S. & P.], Templeton MSS. Altnadua Lake, S. & P. Near Crossgar, C.H.W. Pollramer Lake, S.A.S. Ballydugan Lake, R.Ll.P.

Antrim—In marshes along the shore of Lough Beg, and near Trostan mountain, 1837, Herb. D.M. Bog north of Ballymoney, R.Ll.P.

Derry—Bogs near Maghera, and Garvagh, R.Ll.P.

PRIMULACEÆ.

Hottonia palustris L. "Everogue's Bridge," the original station for this plant, is Crossgar, where it still grows abundantly, R.Ll.P., *B.N.F.C.* 1890-1.

Primula vulgaris L. To 1500 feet in the Mournes, S. & P.

[**P. veris** L.

Antrim—Rare, only found in Glenarm Park, 1837, Herb. D. M. Lambeg, in old pastures, H.W.L.]

Not refound by S. & P. at Rostrevor, the only station in which the authors of *Flora* considered it might be native. "Must be removed from the list of native plants," S.A.S., *I.N.* 1894, in which opinion R.Ll.P. agrees. To show how this plant may be introduced to wild-looking habitats, we may quote the following note by R.Ll.P.:—"Abundant in an old pasture at Cherryvalley near Crumlin. On enquiry it transpired that the stream that waters this meadow passes through a stack-yard in which was stored hay that grew on the lawn at Cherryvalley, where cowslips had been formerly planted, and hence the plant spread to the present station. The cowslips appeared in the meadow the year after the lawn had been cropped for hay."

Lysimachia vulgaris L.

Down—Lakeside at Portavoe, and still at Lough Leagh, R.Ll.P.

L. nummularia L.

Down—Kilmore near Crossgar, C.H.W.

Antrim—Lough Neagh shore at Langford Lodge, R.Ll.P.

Anagallis arvensis L. var. β. **A. cœrulea** Schreb.

Antrim—Bank near the gate of Belfast Botanic Garden, J. J. Andrew; R.Ll.P., *B.N.F.C.* 1890-1.

A. tenella L. To 1600 feet in the Mournes, S. & P.

Down—Frequent in Mourne district, S. & P.

Antrim—Throughout the county, R.Ll.P.

Centunculus minimus L.

Down—Abundant on drained site at Ballymartin Lake, near Annalong, S. & P.

Samolus valerandi L.

Down—Narrow-water demesne and mouth of White Water, S. & P.

Antrim—Shores of Lough Beg, Miss Knowles. Portrush and Dunluce, R.Ll.P.

PLUMBAGINACEÆ.

Statice bahusiensis Fr.

Down—Many places on both sides of Strangford Lough, R.Ll.P.

Antrim—Abundant at upper end of Larne Lough, R.Ll.P.

PLANTAGINACEÆ.

Plantago lanceolata L. To 1150 feet in the Mournes, S. & P.

P. major L. var. **P. intermedia** Lilib.

Antrim—Plentiful on shore of Lough Neagh at Crumlin waterfoot, S.A.S.

Littorella lacustris L. To 1350 feet in the Mournes, S. & P.; there is no lake at 1500 feet, the elevation given by H. C. Hart, *R.I.A.*

CHENOPODIACEÆ.

Salsola kali L.

Antrim—Bushfoot, White Park Bay, R.Ll.P.

Derry—Benone, Mrs. Leebody.

Chenopodium bonus-henricus L.

Antrim—Ballee, Miss Knowles. Cullybackey, S. A. Brenan. Clough and Broughshane, H.W.L. Magheragall near Lisburn, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

Beta maritima L.

Down—Dunnyneile Island near Killyleagh (R.Ll.P.), *B.N.F C.* 1891-2. Portavoe and Millisle, R.Ll.P.; S.A.S., *I.N.* 1894. Newry, R.Ll.P.

Antrim—Maritime rocks from White Park to Derrygregor Head, 1836, Herb. D.M. Refound on Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90. White Park Bay and Kinbane Head, R.Ll.P.; S.A.S., *I.N.* 1894.

Derry—Downhill, Mrs. Leebody.

Atriplex erecta Huds.

Down—Newcastle, S. & P.

Derry—Bellarena, Mrs. Leebody.

A. deltoidea var. β. **A. salina** Bab.
Derry—Shore near Bellarena, Mrs. Leebody.

A. farinosa Dum.
Down—Shore south of Millisle, and still at Groomsport and Newcastle, R.Ll.P.
Antrim—Redbay, Cushendun, and Bushfoot, R.Ll.P., *B.N.F.C.* 1892-3. Foraff, Miss Knowles.

A. portulacoides L.
Down—Plentiful on sea-shore close to railway bank half a mile north of Dundrum, Richd. Hanna.

This is its most northerly station in Ireland. In its other habitat in our district, near Warrenpoint, it is abundant, and extends from Newry southwards.

POLYGONACEÆ.

Rumex sanguineus L. The type is extremely rare. R.Ll.P. has observed it for some years by the roadside between Ballycastle and the sea, which is the only station we know of.

R. hydrolapathum Huds.
Down—Loughinisland (R.Ll.P.), *B.N.F.C.* 1889-90. Ditches on site of Moneyscalp Lake, S. & P. Near Killyleagh (R.Ll.P.), *B.N.F.C.* 1891-2. Kilmore near Crossgar, C.H.W. Tullymurry, Saul, and Ballydugan, R.Ll.P.
Antrim—Near Antrim, D. Redmond.

In the Downpatrick marshes it grows in immense abundance, so that in autumn many acres are tinged red and brown with its stems and fruit.

R. acetosa L. 2790 feet in the Mournes, Hart *R.I.A.* 1891.

R. acetosella L. 2790 feet in the Mournes, Hart *R.I.A.* 1891.

Polygonum bistorta L.
Antrim—Shore of Lough Neagh at Langford Lodge, H.W.L.

P. lapathifolium L.
Down—Abundant on shore of Warrenpoint town reservoir, S. & P.

P. maculatum Dyer.
Down—Dundrum, 1894, C.H.W.

P. aviculare L. var. β. **P. littorale** Link.
Down—Sandy shores at Newcastle and Mill Bay, S. & P.

P. Rail Bab.

Down—Newcastle, S.A.S.; Millisle, R.Ll.P.

Antrim—Redbay and Ballycastle, R.Ll.P.; S.A.S., *I.N.* 1894.

EMPETRACEÆ.

Empetrum nigrum L. 1900-2796 feet in the Mournes, S. & P. 0-1690 feet in Antrim, R.Ll.P.

Antrim—Bogs above Dunloy and Rasharkin, summit of Knocklayd, and at sea-level at Torr, R.Ll.P.

EUPHORBIACEÆ.

Euphorbia exigua L.

Down—Killowen, S. & P. Margins of Lough Leagh (R.Ll.P), *B.N.F.C.* 1891-2. Ballyknowe. near Downpatrick (R.Ll.P.), *B N.F.C.* 1892-3. Conlig, W. D. Donnan. Crossgar and Tullymurry, R.Ll.P.

Antrim—Common about Ballymena, Miss Knowles.

Derry—Kilrea and Ballyscullion, Mrs. Leebody.

Mercurialis perennis L.

Down—In quantity on the "Dane's Cast," close to Scarva House, H.W.L.

Antrim—Still very abundant at Langford Lodge, R.Ll.P.

CERATOPHYLLACEÆ.

Ceratophyllum demersum L.

Down—Carrickmannan Lake near Saintfield, C.H.W.

CALLITRICHACEÆ.

Callitriche stagnalis Scop. 1320 feet in the Mournes, Hart *R.I.A.*

C. hamulata Kuetz. To 1150 feet in the Mournes, S. & P.

var. β. **C. pedunculata** DC.

Down—Mill-dam near Hilltown, S. & P.

C. autumnalis L.

Down—Castlewellan Lake, Annsboro' Lake, and Long Lough, S.A.S. Derry Lake, R.Ll.P.

Antrim—In Lough Neagh at Portmore, Templeton MSS. Abundant in ditches by the Lagan Canal and shores of Lough Neagh, 1837, Herb. D.M. In the river at Bushfoot, and in the Bann at Toome, R.Ll.P.; S.A.S., *I.N.* 1894.

Derry—Growing in the River Bann a little above the bridge, Templeton MSS. Abundant in canal at Kilrea, R.Ll.P.

URTICACEÆ.

Parietaria officinalis L.

Down—Tullybranagan near Newcastle, and Killowen, S. & P. Newry and Clough Castle, H.W.L.

Antrim—Kilroot old church, R.Ll.P.

CANNABINACEÆ.

[**Humulus lupulus** L.

Antrim—Cloghmills, H.W.L.]

AMENTIFERÆ.

Salix pentandra L.

Down—By the Yellow Water in the Mournes, S. & P. Crawfordsburn, Moira, Tullymurry, R.Ll.P.

Antrim—Near Templepatrick, S.A.S. Glendun, S. A. Brenan. Lisburn, Stoneyford, Cairncastle, Drumnasole, Ballymena, Killagan, Capecastle, Bushmills, &c., R.Ll.P.

Derry—Near the leap of Coleraine, Templeton MSS. Frequent about Draperstown, Kilrea, and Garvagh, R.Ll.P.

S. triandra L.

Antrim—Found in a hedge about half-way between Malone and the Falls, and in osier grounds near Portmore Park, Templeton MSS.

S. purpurea L.

Down—Moneyscalp, Crotlieve, and Lisnacree, S. & P. Holywood and Craigavad, R.Ll.P.; S.A.S., *I.N.* 1894. Kilbroney, R.Ll.P.

Antrim—Whitehead (R.Ll.P.), *B.N.F.C.* 1890-1. Broughshane, Rasharkin, Capecastle, Kinbane Head, Bushmills, R.Ll.P.

Derry—Roadsides near Upperlands, and frequent on mountain roads above Draperstown, R.Ll.P.

S. Smithiana Willd.

Down—Several stations in Mourne district, S. & P. Holywood Hills, Ballywalter, Kilkeel, R.Ll.P.

Antrim—Portmore, R.Ll.P.

Derry—Roadsides south of Kilrea, R.Ll.P.

S. aurita L. To 1500 feet in the Mournes, S. & P.

S. caprea L.

Down—Near Rostrevor, Newcastle, Kilbroney River, and Ghann River, S. & P. Holywood Hills, R.Ll.P.

Antrim—Lisburn, Glenarm, Drumnasole, Runabay Head, Rasharkin, &c. R.Ll.P.

S. repens L. To 2000 feet in the Mournes, S. & P.

S. herbacea L. 1700-2790 feet in the Mournes, S. & P.

Down—On most of the Mourne summits, S. & P.

Derry—Mullasturrakeen and Mullaghelogher, R.Ll.P.

A Co. Antrim specimen in Herb. D.M. is labelled "Slievenanee" not "Slievenamon," which is no doubt a misprint in *Cybele Hibernica*.

Populus tremula L. To 1200 feet in the Mournes, S. & P.

Down—Cliffs south of Blue Lough, S. & P. On rough ground and railway cuttings south of Crossgar, R.Ll.P.

Antrim—Cliffs of Knockagh and Garron Point, and near source of Braid River, and refound on Rathlin. R.Ll.P.

Derry—Among rocks between Kilrea and Garvagh, R.Ll.P.

Myrica gale L. To 1400 feet in the Mournes, S. & P.

Betula glutinosa Fries. To 1400 feet in the Mournes, S. & P.

Down—Frequent in Mourne Mountains, S. & P.

Antrim—Glenariff, Shoolbred *I.N.* Ram's Island, R.Ll.P.

var. β. **B. pubescens** Ehr.

Antrim—Glenariff and Glendun, Shoolbred *I.N.*

Quercus robur L. To 1300 feet in the Mournes, S. & P.

Corylus avellana L. To 1000 feet in the Mournes, S. & P.

CONIFERÆ.

Taxus baccata L.

Antrim—Rocks in the little Deerpark, Glenarm, and on the Cave Hill, 1836, Herb. D.M. Certainly not now on Cave Hill, S.A.S.

Juniperus nana Willd. To 2000 feet in the Mournes, Hart *R.I.A.* 1000-2000 feet in the Mournes, S. & P.

Down—Local in the Mourne Mountains, S. & P.

Antrim—Refound in Glenariff, R.Ll.P.

Derry—Refound on Benevenagh (R.Ll.P.), *B.N.F.C.* 1892-3.

Juniperus sabina L. Templeton suggests in his MSS. that *Lycopodium alpinum*, "which is named by many people Mountain Savin," was the plant intended by Harris (see *Flora N.E.I.*, p. 301).

HYDROCHARIDACEÆ.

Hydrocharis morsus-ranæ L.

Antrim—Bogholes at Gawley's Gate, 1½ miles west of its Portmore habitat, R.Ll.P., *B.N.F.C.* 1892-3. Introduced at Cushendun by S. A. Brenan.

ORCHIDACEÆ.

Orchis incarnata L.

Down—Near Kilkeel, and by Kilkeel River under Slieve Bingian, S. & P.

Antrim—Stoneyford, Crumlin, and shores of Lough Beg, R.Ll.P.

Derry—Maghera, Kilrea, Garvagh, R.Ll.P.

O. pyramidalis L.

Antrim—Sparingly on chalk rubbish at Magheragall quarries near Lisburn, R.Ll.P., *B.N.F.C.* 1890-1.

Derry—In some abundance at the eastern end of Magilligan strand, Mrs. Leebody; R.Ll.P., *B.N.F.C.* 1892-3.

The single specimen that Dr. Moore found at Magilligan (*Cybele Hibernica*) was no doubt native, and was the first discovery of the species in the district.

Gymnadenia conopsea (L.) R.Br.

Antrim—Glynn, Herb. D.M. Cairncastle and Giant's Causeway, R.Ll.P.

Derry—Between Portstewart and Portrush, R.Ll.P.

G. albida (Swartz) Rich.

Down—Conlig Hill, R.Ll.P.; S.A.S., *I.N.* 1894.

Antrim—On Carrickfergus Commons, and near Ballycastle, Herb. D.M. Glenariff, S. A. Brenan, and refound on Squire's Hill by W. H. Patterson; S.A.S., *I.N.* 1894. White Mountain above Lisburn, R.Ll.P.

Habenaria viridis (L.) R.Br.

Down—North of Annalong, and in Kilbroney valley, S. & P. Conlig Hill, R.Ll.P.

Antrim—Glendun, S. A. Brenan. Carnaneigh, Binnagee, Dunloy, Knocklayd, and common about Stoneyford, R.Ll.P.

Derry—Benevenagh, R.Ll.P., *B.N.F.C.* 1892-3. Abundant from Benevenagh to Benbradagh, Mrs. Leebody. Maghera, Kilrea, Garvagh, and near Sconce Hill, R.Ll.P.

H. bifolia R.Br.

Down—North of Annalong, and in the Kilbroney valley, S. & P.

Antrim—Cushendun, S. A. Brenan. Killagan, Causeway headlands, and common about Stoneyford, R.Ll.P.

Derry—Enagh Lough, Mrs. Leebody; S.A.S., *I.N.* 1894. Near Dungiven, Mrs. Leebody. Near Kilrea and Sconce Hill, R.Ll.P.

H. chlorantha Bab.

Down—Frequent in the Mournes district, S. & P.

Antrim—Glenariff, Shoolbred *I.N.* Dunloy, Rasharkin, and common about Stoneyford, R.Ll.P.

Derry—Common in north Derry, Mrs. Leebody. Common in the Bann valley, R.Ll.P.

Spiranthes Romanzoviana Cham.

Derry—Near Kilrea, Mrs. Leebody; *I.N.* 1893, and R.Ll.P. in *Joun. Bot.* 1898.

This extremely rare plant, the best addition to the flora of the north-east which we have to record, grows here in some abundance in meadows, which should be described as damp pasture, rather than worn-out bog. It should be looked for in similar situations elsewhere in the Bann valley. The counties of Armagh and Cork are its only other stations in Europe.

Listera cordata (L.) R.Br.

Down—Slieve Bearnagh, Eagle Mountain, Carn Mountain, Slieve Lough Shannagh, S. & P.

Antrim—On the Garron plateau, R.Ll.P.

Derry—Benevenagh, Mrs. Leebody.

Neottia nidus-avis (L.) Rich.

Antrim—Glenariff, (R.Ll.P.), *B.N.F.C.* 1889-90. Whitehall near Broughshane, S. A. Brenan.

Derry—Wood below Benevenagh (Miss Knowles), *B.N.F.C.* 1892-3.

Epipactis latifolia (L.) Swartz.

Down—Dromantine demesne, H.W.L.

Antrim—Near Ballymena, S. A. Brenan.

ALISMACEÆ.

Sagittaria sagittifolia L.
Antrim—Crumlin Waterfoot, R.Ll.P.

Butomus umbellatus L.
Down—Still at Lough Leagh, (R.Ll.P.), *B.N.F.C.* 1891 2.
Antrim—Mouth of Six-mile water, W. S. Smith. Crumlin waterfoot, Miss Knowles. Recently introduced at Langford Lodge from the Lagan, S.A.S.

LILIACEÆ.

Scilla verna L.
Down—Abundant Ardglass to Killough, R.Ll.P.
Antrim—Still abundant on Rathlin, R.Ll.P., *B.N.F.C.* 1889-90.

Allium ursinum L.
Down—Mourne Park, Bloody Bridge, Tollymore Park, S. & P. Dundonald and Downpatrick, R.Ll.P.
Derry—West of Downhill, Mrs. Leebody.

JUNCACEÆ.

Juncus maritimus Sm.
Antrim—Sparingly at the Giant's Causeway, Herb. D.M.

J. effusus L. To 1837 feet in the Mournes, S. & P.

J. glaucus (Huds.) Ehr.
Down—Waste ground behind Queen's Island Shipyard, W. D. Donnan.
Antrim—Cushendun, S. A. Brenan. Ballycarry, Glynn, Langford Lodge, R.Ll.P.

J. obtusiflorus Ehr.
Down—Marshy places on the Downs at Ardglass, C.H.W. Refound at Dundrum Bay, by the railway ¾ mile north of Dundrum, S.A.S.

J. acutiflorus Ehr. To 1900 feet in the Mournes, S. & P.

J. supinus Moench. To 2000 feet in the Mournes, S. & P.
Down—Frequent in the Mournes. A submersed very slender form, many feet in length, grows in the lakes and streams in up to 4 feet

of water, S. & P. Aughnadanagh Lake near Saintfield (approaching var. *subverticillatus*), C.H.W., *Watson B.E.C.* 1893.

Antrim—Slatt, Ballee, and Glenariff, Miss Knowles. Bogs near Rasharkin and Dervock, R.Ll.P.

Derry—Limavady, Mrs. Leebody. Common about Maghera, Kilrea, Garvagh, and Coleraine, R.Ll.P.

J. squarrosus L. To 2510 feet in the Mournes, S. & P.

TYPHACEÆ.

Typha latifolia L.

Down—Site of Moneyscalp Lake, Warrenpoint town reservoir, Narrowwater demesne, S. & P. Meenan Bog near Loughbrickland, H.W.L. Bangor, Portavoe, Seaforde, Loughinisland, R.Ll.P.

Antrim—Bush River, R.Ll.P.

Derry—Drains at Ballyscullion, Mrs. Leebody.

T. angustifolia L.

Down—In Lough Neagh at mouth of Lagan Canal, R.Ll.P., *B.N.F.C.* 1892-3. Still abundant in Lough Henney, C.H.W. Abundant in Derry Lough near Ballynahinch, S.A.S.

Sparganium ramosum Huds. var. *b.* **microcarpum** Neuman.

Down—Loughinisland, C.H.W.

S. simplex Huds.

Down—Near Kilkeel, Newcastle, and Warrenpoint, S. & P. Loughinisland (R.Ll.P.), *B.N.F.C.* 1889-90. Moira, C.H.W. Comber, R.Ll.P.

Antrim—Bush River, R.Ll.P.

Derry—Kilrea, Mrs. Leebody. Near Portglenone, R.Ll.P.

S. natans L.

Down—Altnadua Lake, S. & P.

Antrim—In the Lagan, between the first and second locks, R.Ll.P.

S. minimum Fr.

Down—Milltown near Warrenpoint, S. & P. Small lake near Crossgar, C.H.W.

Antrim—Bog-holes west of Scawt Hill, R.Ll.P.; S.A.S., *I.N.* 1894. Near Parkmore, S. A. Brenan.

ARACEÆ.

Acorus calamus L. Quite naturalized throughout the course of the Lagan Canal.

Arum maculatum L. To 1000 feet in the Mournes, S. & P.

POTAMOGETONACEÆ.

Potamogeton polygonifolius Pourr. 1550 feet in the Mournes, Hart *R.I.A.*

P. rufescens Schrad.
Down—Lake (Ballykine Lough), Ballynahinch, R.Ll.P.; *Watson B.E.C.* 1891-2. Burren River near Newcastle, S. & P.

P. nitens Weber.
Down—Annsboro Lake, S.A.S., *I.N.* 1894.
Antrim—Six-mile water near Antrim, S.A.S., *I.N.* 1894.

P. lucens L.
Derry—Magilligan, Mrs. Leebody.
var. c. **longifolius** Gay.
Antrim—Washed ashore at Crumlin Waterfoot, S.A.S.

P. undulatus Wolfg. (= *P. perfoliatus* x *crispus*).
Antrim—In the Six-mile River above Templepatrick, S.A.S., 1882-94. An infertile hybrid which grows in abundance at junction with Doagh River and other places, *vide* Bennett, *Journ. Bot.* 1894, and S.A.S., *I.N.* 1894.

P. Zizii Roth.
Down—Lagan Canal near Blaris, S.A.S.
Antrim—Lough Neagh at Cranfield, S.A.S.
Derry—Bann at Kilrea, Mrs. Leebody.

P. obtusifolius M. & K.
Down—Loughinisland, R.Ll.P.
Derry—Killelagh Lake above Maghera, R.Ll.P.

P. pectinatus L.
Down—Clandeboye Lakes, R.Ll.P.
Antrim—Quarry pools at Magheragall near Lisburn, R.Ll.P.
Derry—Eglinton, Mrs. Leebody.

Ruppia maritima L.

Derry—Carrickhue, Mrs. Leebody.

R. rostellata Koch.

Down—Stream at Blackstaff Bridge near Kirkcubbin, R.Ll.P.

Zannichellia palustris L.

Down—Stream at Blackstaff Bridge near Kirkcubbin, R.Ll.P.

Derry—Common in the Bann from Coleraine to the sea, R.Ll.P.

CYPERACEÆ.

Schœnus nigricans L. To 1800 feet in the Mournes, S. & P.

Antrim—Lough Naroon, R.Ll.P.

Cladium mariscus (L.) R.Br.

Down—Sparingly on northern margin of Altnadua Lake near Castlewellan, S. & P. This is no doubt Templeton's station, the location of which is discussed in *Flora*; the plant was thought to be extinct in N.E. Ireland.

Antrim—In Lough Neagh at Portmore, Templeton MSS. Appears to be now extinct at Lough Neagh.

Rhynchospora alba (L.) Vahl. 350-1225 feet in the Mournes, S. & P.

Down--Pools by Kilkeel River under Slieve Bingian; near Colligan Bridge; base of Slieve-na-brock; and near Cove Mountain, S. & P.

Antrim—"With ripe seeds gathered in a bog near Ballycastle, 1797," R. Brown Bogs around Ballymoney [still there, R.Ll.P.], and frequent in flow bogs in the north of the county, Herb. D.M.

var. **β. sordida.**

Antrim—Bog near Ballymena, Miss Knowles.

Eleocharis acicularis (L.) Sm.

Down—Shores of Lough Neagh at Anadroghal, H.W.L.

Derry—Lough Neagh near Toome, and abundant in the centre of Lough Beg, R.Ll.P., *Journ. Bot.* 1893. The plant appears to grow everywhere on the sandy bottom of Lough Beg in up to four feet of water, and over an area of several square miles. This submerged form has short, straight stems, and is always barren, R.Ll.P. (See *Journ. Bot.* 1893.)

Scirpus maritimus L.

Down—Mill Bay and above Warrenpoint, S. & P.

S. sylvaticus L.

Down—Tollymore Park, S. & P. Ballydugan Lake and near Killyleagh, R.Ll.P.

Antrim—Broughshane, and by the Bann occasionally, R.Ll.P.

Derry—In several places by the Bann, Mrs. Leebody and R.Ll.P.

S. lacustris L.

Down—Ballydugan and Killyleagh, R.Ll.P.

Antrim—Near Broughshane, Herb. Canon Grainger. Several places in Main River, Miss Knowles and R.Ll.P. Rathlin Island, R.Ll.P.

S. Tabernæmontani Gm.

Derry—Near Culmore, Mrs. Leebody.

S. pauciflorus Lightf.

Down—Between Dunny Water Bridge and Annalong, Hart *R.I.A.*

Antrim—Rathlin Island, S.A.S.

Derry—Sandy shore of the Bann near its mouth, R.Ll.P.

S. fluitans L.

Down—Hilltown, Shimna River, Narrow-water demesne, S. & P. Holywood Hills, R.Ll.P.

Antrim—Causeway Headlands, R.Ll.P.

S. setaceus L.

Down—Tollymore Park, and source of Kilbroney River, S. & P. Saintfield, C.H.W. Carngaver and Ballynahinch, R.Ll.P.

Antrim—Glenoe, Herb. D.M. Near Fair Head, and between Ballycastle and Ballintoy, Shoolbred *I.N.* Bushfoot, R.Ll.P.

Derry—Limavady and Enagh Lough, Mrs. Leebody. Garvagh, R.Ll.P.

S. Savii S. & M. 820 feet in the Mournes, Hart *R.I.A.*

Down—Glasdrumman, Dunny Water Bridge, White Water, Kilkeel, Narrow-water, S. & P. Victoria Park, R.Ll.P.

Derry—Castlerock, R.Ll.P.

Blysmus rufus (Huds.) Link.

Down—Grey Point, and abundant from Kilclief to Strangford, R.Ll.P.

Eriophorum polystachion L. var. γ. **elatius** Koch.

Antrim—Bogs at Slatt and Ballee near Ballymena, Miss Knowles. Fine specimens, over 3 feet in height.

Carex dioica L.

Antrim—Abundant through the parish of Ramoan, Herb. D.M.

C. pauciflora Lightf.

Antrim—Bog above Glenariff, 1889, H.W.L. An interesting and welcome addition to the Irish flora.

C. disticha Huds.

Down—Near Crossgar, C.H.W.

Antrim—Salt marshes by Larne Lough, Herb. D.M. Rathlin Island, R.Ll.P., *I.N.* 1893. Common where the Bann leaves Lough Beg, R.Ll.P.

C. arenaria L.

Antrim—Cushendun, White Park Bay, Bushfoot, Portrush, R.Ll.P.

C. vulpina L.

Down—Mill Bay and Narrow-water, S. & P. Ardglass (R.Ll.P.), *B.N.F.C.* 1892-3. Holywood and Sketrick, R.Ll.P.

Antrim—Frequent along the shores of Islandmagee, Herb. D.M. Whitehead, H.W.L.

Derry—Eglinton, Mrs. Leebody. Bann mouth, R.Ll.P.

C. muricata L.

Antrim—Marshy pasture between Springfield Road and the Forth River above Clowney Bridge, Richd. Hanna; S.A.S., *I.N.* 1894.

C. teretiuscula Good.

Derry—Abundant on marshy margin of Killelagh Lough above Maghera, Mrs. Leebody and R.Ll.P. This plant was believed to be extinct in the district.

C. paniculata L.

Antrim—Grange of Killagan, and Parish of Aghagallon, Herb. D.M. Near Muckamore, B.N.F.C.; *I.N.* 1893. Ram's Island, H.W.L. Portmore Lake, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

C. canescens L.

Down—Carngaver, R.Ll.P.

Antrim—Killagan, and bogs above Dunloy and Rasharkin, R.Ll.P.

Derry—Near Kilrea, Mrs. Leebody.

C. leporina L.

Down—Sparingly on the lower grounds of Mourne district; abundant around Lough Island Reavy, S. & P. Aghaderg, H.W.L. Victoria Park, W. D. Donnan. Conlig, Killinchy, Downpatrick, R.Ll.P.

Antrim—Ballee and Cullybackey, Miss Knowles. Killagan and Dunloy, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

C. stricta Good.

Antrim—Side of Lough Neagh at Shane's Castle, Herb. D.M. Abundant and luxuriant on several spots around Portmore Lough, and islet on Antrim side of Lough Beg, R.Ll.P.; S.A.S., *I.N.* 1894. Frequent where the Bann leaves Lough Beg, and again half-way to Portglenone, and abundant on the river edge for half-a-mile at Portglenone House, R.Ll.P.

Derry—Side of the Bann near Coleraine, Herb. D.M. [Still there, below the town, R.Ll P.] Side of the Bann below Toome, R.Ll.P.; S.A.S., *I.N.* 1894. By the Bann at Kilrea, Mrs. Leebody.

This plant, for which in *Flora* only Templeton's notes could be quoted, is thus abundantly restored to its place in our flora.

C. acuta L.

Antrim—Banks of the River Main, near Ballandraid, Herb. D.M.

C. rigida Good. Dr. Dickie's record, "Summit of Slieve Donard," was certainly an error, S. & P.

C. aquatilis Wahl. var. **elatior** Bab.

Antrim—Ditch by the Main River in Shane's Castle Park, R.Ll.P., *Journ. Bot.* 1892. See also A. Bennett in *I.N.* 1892.

C. Goodenovii Gay. To 1450 feet in the Mournes, Hart *R.I.A.*; to 1400 feet, S. & P.

C. pallescens L.

Down—Tollymore Park, S. & P. Dundrum and Saintfield, C.H.W. Aghaderg, H.W.L.

Derry—Kilrea, R.Ll.P.

C. limosa L.

Down—Plentiful in a wet marsh on Saul Camp ground at Downpatrick, R.Ll.P., *B.N.F.C.* 1892-3.

Antrim—Bog east of Killagan railway station, margins of Lough Naroon, and still frequent on wet bogs above Rasharkin, R.Ll.P.

Derry—Margins of Lough Ouske in the Sperrin Mountains, R.Ll.P. *Journ. Bot.* 1892.

C. strigosa Huds.

Antrim—Near Muckamore, B.N.F.C.; *I.N.* 1893.

C. pendula Huds.

Antrim—Glenariff, Shoolbred *I.N.* Langford Lodge, H.W.L. Woodburn Glen, R.Ll.P.

C. præcox Jacq.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90.

Derry—Near Bellarena, Mrs. Leebody. Kilrea, R.Ll.P.

C. pilulifera L.

Antrim—Glenariff, Shoolbred *I.N.*

C. glauca Scop. To 2510 feet in the Mournes, S. & P.

C. Œderi, *auct. plur.*

Down—Aughnadarragh Lake, C.H.W.; *Watson B.E.C.* 1893-4. By Pollramer Lake, S.A.S.

C. extensa Good.

Down—By the Quoile below Downpatrick, R.Ll.P.

Derry—Coleraine, Mrs. Leebody. Bann mouth, R.Ll.P.

C. Hornschuchiana Hoppe. To 1700 feet in the Mournes, S. & P.

Down—Between Dunny Water Bridge and Annalong, Hart *R.I.A.* Frequent on the Mournes, S. & P. Carngaver, R.Ll.P.

Antrim—Glenshesk, bogs above Agnew's Hill, and head of Glenariff, Herb. D.M. Bogs above Dunloy and Rasharkin, R.Ll.P.

Derry—Killelagh Lough above Maghera, and near Kilrea, R.Ll.P.

C. distans L.

Down—South of Rostrevor, S. & P.

Antrim—Below Cushendall, Herb. D.M.

Derry—Near Portstewart, Mrs. Leebody. Bann mouth, R.Ll.P.

C. binervis Sm. To 2394 feet on the Mournes, S. & P.

C. lævigata Sm.

Down—Between Dunny Water Bridge and Annalong, Hart *R.I.A.* Mourne Park, S. & P. Kilmore near Crossgar, C.H.W., *Watson B.E.C.* 1893-4.

Derry—Dungiven, Mrs. Leebody.

C. filiformis L.

Antrim—A fine specimen is in Herb. D.M., labelled "At Selchin new deer park, side of Lough Neagh, July, 1832." This plant, which is included among the "Plants erroneously recorded" in *Flora*, must therefore be restored to its place in our flora, though it is feared it is now extinct, through drainage, along with *C. elongata*, which grew at the same place.

C. hirta L.

Down—White Water, S. & P. Aghaderg and Tullylish, H.W.L. Cultra, R.Ll.P.

Antrim—Shane's Castle, W. D. Donnan. Glenarm, R.Ll.P.

Derry—Maghera, Mrs. Leebody. Bellarena, W. Kennedy. Kilrea, R.Ll.P.

C. rostrata Stokes. To 1150 feet in the Mournes, Hart *R.I.A.;* also S. & P.

var. β. **robusta** Sonder.

Down—Brown Bog near Loughbrickland, H.W.L.

C. vesicaria L.

Down—Pollramer Lake, C.H.W. Brown Bog near Loughbrickland, H.W.L.

Antrim—Cushendall, and abundant by the Bann at Portglenone House and at its outflow from Lough Beg, R.Ll.P.

Derry—By the Bann at Kilrea, Mrs. Leebody.

C. paludosa Good.

Derry—Side of the River Bann below Coleraine, Herb. D.M.

C. riparia Curt.

Antrim—Still at Portmore, by the Tunny drain, R.Ll.P.

Derry - Abundant in several spots on south bank of Bann, between Coleraine and the sea, R.Ll.P.

GRAMINEÆ.

Anthoxanthum odoratum L. To 2394 feet in the Mournes, S. & P.

Alopecurus pratensis L.

Down—Donaghadee, S.A.S., *I.N.* 1894.

Antrim—Stranmillis, Ballygomartin, and roadside beyond Ligonie, S.A.S.

Nardus stricta L. To 2449 feet in the Mournes, S. & P.

Milium effusum L.

Down—Wooded shore of lough south of Rostrevor, S. & P. Drumcro and near Magheralin, C.H.W.

Antrim—Collon [Colin] Glen, near the large waterfall, Herb. D.M.

Phragmites communis Trin.

Down—Common in Mourne district, S. & P. Holywood and Newtownards, R.Ll.P.

Antrim—Shane's Castle, wet bogs above Dunloy and Rasharkin, and frequent in Lough Beg, and by the Bann from Lough Beg to the sea in Antrim and Derry, R.Ll.P.

Calamagrostis epigejos Roth. Searched for at Formoyle Hill by Mrs. Leebody in 1893, and by Mrs. Leebody, Miss Knowles, and R.Ll.P. in 1894, without success; apparently extinct there.

C. Hookeri Syme.

Antrim—On the shore of Lough Neagh occasionally all the way from Toome Bridge to Antrim, Herb. D.M.

Coney Island was inadvertently printed in *Flora* for Church Island. Searched for here by R.Ll.P. in 1893, without success; the place is now close-cropped pasture.

Agrostis canina L. To 2300 feet on the Mournes, S. & P.

Down—Common in the Mourne district, S. & P. Ballyalloly, and hills above Dundonald, S.A.S.

Antrim—Mazetown, Castle Upton, and Crumlin Waterfoot, S.A.S.

A. vulgaris With. var. β. **A. pumila** Lightf. 1200–1600 feet in the Mournes, S. & P.

Down—Slieve Bingian and Eagle Mountain, S. & P.

Antrim—Ballycastle, R.Ll.P.

Derry—Benevenagh, R.Ll P., *B.N.F.C.* 1892-3. Near Maghera and Kilrea, sand-dunes at Bann mouth, and fields at Magilligan, R.Ll.P.

A. alba L. To 2055 feet on the Mournes, S. & P.

Holcus lanatus L. To 1350 feet on the Mournes, S. & P.

H. mollis L.

Down—A tall (4 feet) slender form at White Water, S. & P. Castlewellan Park, S.A.S.

Derry—Limavady, Mrs. Leebody. Kilrea, R.Ll.P.

Aira flexuosa L. To 2790 feet on the Mournes, Hart *R.I.A.*, also S. & P.

Down—Common on the Mournes, S. & P. Hills above Dundonald, S.A.S.

Antrim—Above Dunloy and Rasharkin, R.Ll.P.

Derry—Benevenagh and Benbradagh, S.A.S. Garvagh, R.Ll.P.

A. præcox L. To 1662 feet on the Mournes, S. & P.

Trisetum flavescens (L.) Beauv.

Down—Killyleagh (R.Ll.P.), *B.N.F.C.* 1891-2. Marino, Cultra, New townards, R.Ll.P.

Antrim—Plenty near Antrim and Ballinderry, Herb. D.M. Lisburn Park, Greenisland, Carrickfergus, R.Ll.P.

Derry—On a wall at Garvagh, R.Ll.P.

[**Avena fatua** L.

Antrim—Rubbish heaps at Springfield, Belfast, with other casuals, S.A.S.]

[**A. strigosa** Schreb.

Antrim—Frequent near Clogh Mills, Herb. D.M.]

A. pubescens L.

Down—Shore at Craigavad, R.Ll.P.; S.A.S., *I.N.* 1894. Holywood, W. D. Donnan. Not found by S. & P. at Newcastle (Templeton's station).

Antrim—Cliffs of Cave Hill, and in Parkmore wood, S.A.S.

Triodia decumbens Beauv.

Derry—Mourne district frequent, S. & P. Near Lough Shark, H.W.L. and C.H.W.

Antrim—Glenariff, Shoolbred *I.N.* Cushendun, Dunloy, R.Ll.P.

Derry—Maghera, Kilrea, Garvagh, Bann mouth, R.Ll.P.

Koehleria cristata (L.) Pers.

Antrim—Dry, sandy ground at Cushendall, Herb. D.M. Still at Giant's Causeway, and still on Islandmagee, growing 3 feet high at the Rocking-stone, R.Ll.P.

Melica uniflora Retz.

Down—Frequent in Mourne district, S. & P. Downpatrick, R.Ll.P.

Antrim—Glenariff, H.W.L. Carnlough and Shane's Castle, R.Ll.P.

Derry—Garvagh, Mrs. Leebody. Kilrea, R.Ll.P.

Molinia cærulea Schreb. To 2449 feet on the Mournes, S. & P.
Antrim—Bogs at Killagan and above Dunloy, R.Ll.P.

Poa annua L. To 2450 feet on the Mournes, S. & P.

P. pratensis L. To 1350 feet on the Mournes, S. & P. We could not find it on summit of Slieve Donard, whence it is recorded with a ? by Dickie *(Flor. Ulst.)*, and apparently copied from this work (but without the ?) into *Cybele Hibernica* and Mr. Hart's *Report*, R.I.A. 1891; and we believe this note to be a mistake.

Glyceria fluitans (L.) R.Br. To 1150 feet in the Mournes, S. & P.

Schlerochloa distans (L.) Bab.
Down—Warrenpoint, S. & P.

S. rigida (L.) Link.
Down—Walls by the sea at Ardglass and Killough, R.Ll.P., *B.N.F.C.* 1892-93.
Antrim—Wall top at Magheramorne railway station, R.Ll.P.

S. loliacea (Huds.) Woods.
Down—White Water, and near Newcastle, S. & P. By Ballydugan Lake, R.Ll.P.
Antrim—Redbay, Cushendun, and still at Ballycastle and Olderfleet, R.Ll.P.

Briza media L.
Down—Narrow-water, S. & P. Newcastle, C.H.W. Killinchy, R.Ll.P.

Catabrosa aquatica Beauv.
Down—Saintfield, D. Redmond.
Antrim—Dervock, R.Ll.P.
Derry—Lignapeiste Glen, Mrs. Leebody. Near Upperlands and Maghera, Miss Knowles. Near Garvagh, R.Ll.P.

Festuca sciuroides Roth.
Down—Near Warrenpoint, S. & P. Rostrevor, H.W.L. Downpatrick, and still at Holywood, R.Ll.P.
Antrim—Randalstown, W. D. Donnan.

F. ovina L. Type ascends to 1500 feet, and viviparous form ranges from 200 to 2796 feet on the Mournes, S. & P.
var. β. **F. tenuifolia** Sibth.
Down—Cliffs of Slieve Muck, at 1500 feet, S.A.S.

var. γ. **F. duriuscula** L.

Antrim—Frequent in meadows throughout the Co. of Antrim, especially along the shores of L. Neagh, Herb. D.M. Glenariff, Shoolbred *I.N.* Knockagh, R.Ll.P.

F. rubra L. To 1600 feet in the Mournes, S. & P.

F. sylvatica Vill.

Down—Abundant and luxuriant by the Shimna and Spinkwee Rivers in Tollymore Park, S. & P.

F. gigantea Vill.

Down—Moygannon Glen, Mourne Park, Tollymore Park, S. & P. Holywood Waterworks, R.Ll.P.

Antrim—Crumlin Waterfoot, S.A.S. Massereene Park, R.Ll.P.

Derry—Magilligan, Mrs. Leebody.

F. arundinacea Schreb.

Down—Tollymore Park, S. & P. Dundrum, R.Ll.P.

Antrim—Templepatrick and Knockagh, S.A.S. Island at north end of Lough Beg, Mrs. Leebody. Bushfoot, R.Ll.P.

Derry—Upperlands, Kilrea, and Magilligan, R.Ll.P.

Bromus sterilis L.

Down—Abundant from Killowen to Seafield, and sparingly at Warrenpoint, S. & P. Killowen church at Killyleagh, (R.Ll.P.), *B.N.F.C.* 1891-2.

Antrim—Roadside between Ballycastle and the sea, R.Ll.P.

For "railway bank" at Marino in *Flora* read "railway bridge."

B. racemosus L.

Down—Holywood, R.Ll.P.

Antrim—Whitewell, R.Ll.P.

[**B. secalinus** Bab.

Antrim—Waste ground at Duncrue Street, Belfast, and hedge-bank at Magheragall near Lisburn, R.Ll.P.]

Triticum caninum L.

Down—Shore a mile south of Newcastle, and near Kilkeel, S. & P. Sandy shore at Groomsport, S.A.S.

T. acutum DC.

Down—Gravelly shore of Ballyhornan Bay, S.A.S.
Antrim—Sandy shore, Red Bay, Shoolbred *I.N.*

T. junceum L.

Down—Kilkeel and Greencastle, S. & P.
Antrim—Ballycastle, R.Ll.P.

[**Hordeum murinum** L.

Antrim—Garron Point, 1861, H.W.L.]

Lepturus filiformis Trin.

Down—Between Warrenpoint and Narrow-water, H.W.L.
Antrim—Shores at Larne Lough plentifully, Herb. D.M.

[**Lolium temulentum** L.

Antrim—Near Larne, Herb. D.M.
Derry—Near Limavady, Mrs. Leebody.]

CRYPTOGAMIA.

EQUISETACEÆ.

Equisetum pratense Ehr.

Antrim—Glenocum; plentiful in a small glen branching off Glenbush, near the head of the latter, Herb. D.M. Carnlough, Herb. Canon Grainger. Glen on north side of Garron Point, R.Ll.P.

E. sylvaticum L. To 1000 feet in the Mournes, S. & P.

Down—Frequent in Mourne district, S. & P.

Antrim—Rasharkin, and from Ballymoney to Ballycastle, R.Ll.P.

Derry—Near Londonderry, Mrs. Leebody. Kilrea and Garvagh, R.Ll.P.

E. limosum L. To 1000 feet on the Mournes, S. & P.; to 1000 feet on Garron Point, R.Ll.P.

E. palustre L., var. **β. polystachium.**

Antrim—Portrush sandhills, and sandy shore of Lough Neagh at Shanes' Castle, R.Ll.P.

var. γ. **nudum** DC.

Antrim—Sandy shore of Lough Neagh at Shane's Castle, R.Ll.P.

E. hyemale L. To 1700 feet on the Mournes (C.H.W.), S. & P.

Down—By Kilbroney River, Yellow Water, Rocky River near Hilltown, Annalong River, and on Thomas Mountain (C.H.W.), S. & P. Near Edenderry, Templeton MSS.; refound here by R.Ll.P., on the edge of the Lagan; *B.N.F.C.* 1892-3. On the Lagan side half way between Shaw's Bridge and Drum Bridge [? Down or Antrim], Templeton MSS.

Antrim—Cullybackey, Herb. Canon Grainger. Glen above Hightown, north of Squire's Hill, C.H.W. By the Glenarm River above Park mill, and northern branch of Glenariff, R.Ll.P., *B.N.F.C.* 1892-3.

Derry—Glen near Magilligan, Mrs. Leebody.

E. trachyodon A. Braun.

Antrim—Glenariff, Herb. D.M.

Derry—Refound in Ballyharrigan Glen, Mrs. Leebody.

FILICES.

Cryptogramme crispa R.Br. 1200-1700 feet on the Mournes, S. & P.

Down—Extremely rare, but seen in four of its half-dozen known Mourne stations by S. & P.

Polypodium vulgare L. To 2449 feet on the Mournes, S. & P.

P. phegopteris L. To 2250 feet in the Mournes, Hart *R.I.A.* 800-2000 feet on the Mournes, S. & P.

Down—Frequent on the Mournes; some 20 stations are given by S. & P.

Antrim—Glencloy, R.Ll.P.

P. dryopteris L. Searched for on Knocklayd by S.A.S. in 1882, and by R.Ll.P. in 1892 and 1894, but without success. A more unlikely habitat for this fern than the bare slopes of Knocklayd could not be imagined, but Dr. Moore's record is supported by specimens in his herbarium. Could it have been planted there, as *P. Robertianum* was on Carlingford Mountain (*I.N.* 1893, p. 22)?

astrea thelypteris Presl.

Antrim—Portmore Lough, Selchin, side of Lough Neagh, Herb. D.M.—additional notes which go to show the abundance of this fern before drainage operations destroyed it.

L. oreopteris (Ehr.) Presl. 20-2000 feet on the Mournes, S. & P.

Down—A number of Mourne stations are given by S. & P., but the plant grows chiefly on the lower grounds of the northern slope, from Slieve Donard to Slievenaman.

Derry—By the Glenomna water, and on roadside above Upperlands, R.Ll.P.

L. filix-mas (L.) Presl. To 1500 feet on the Mournes, S. & P.

var. β. **L. Borreri** Neum.

Common throughout the three counties, R.Ll P.

var. δ. **L. abbreviata** DC.

Down—Abundant on cliffs of Eagle Mountain, 1300-1500 feet, S. & P.

L. spinulosa (Roth) Presl.

Derry—On bogs two miles south of Kilrea, R.Ll.P. Refound by the Roe above Limavady, Mrs. Leebody.

L. dilatata (Willd.) Presl. To 2449 feet on the Mournes, S. & P.

L. æmula Brack. 100-1430 feet on the Mournes, S. & P.

Down—Local in Mourne district. S. & P. Saintfield, C.H.W.

Antrim—Glendun, S. A. Brenan. Roadside south of Bushmills, R.Ll.P.

Derry—By the Roe above Limavady, Mrs. Leebody.

Polystichum aculeatum (L.) Roth.

Down—Craigauntlet and Killinchy, R.Ll.P.

Antrim—Shane's Castle and Dunloy, R.Ll.P.

Cystopteris fragilis (L.) Bernh. 800—2000 feet on the Mournes, S. & P.

Down—Along the Slieve Muck ridge, S. & P.

Antrim—North base of Knocklayd, Herb. D.M. Glenshesk, J. H. Davies.

Derry—Cliffs of Benevenagh, Shoolbred *I.N.* Old wall at Kilrea, Mrs. Leebody.

Athyrium filix-fœmina (L.) Roth. To 2449 feet on the Mournes, S. & P.

Asplenium adiantum-nigrum L. To 1300 feet on the Mournes, S. & P. Common throughout the district—a long list of further localities might be given.

var. β. *A. acutum* Bory. The Benevenagh plant of *Flora*, though a very acute form of *A. adiantum-nigrum*, cannot be correctly placed here. Sherard's Mourne Mountain plant (Herb. Oxon. and *Raii Synopsis*) is a barren plumose form of *Athyrium filix-fœmina*, the same as that known to fern growers as *kalothrix*, S. & P.

A. trichomanes L. To 1600 feet on the Mournes, S. & P.

Down—Frequent throughout the Mournes, S. &. P. Crawfordsburn, R.Ll.P.

Antrim—White Park Bay and Giant's Causeway, R.Ll.P.

Derry—By the Roe above Limavady, Mrs. Leebody.

A. marinum L.

Derry—Benevenagh Cliffs, Shoolbred *I.N.*

A. ruta-muraria L. Growing on trap-rock on Benevenagh, R.Ll.P., *B.N.F.C.* 1892-3, and the same at Fair Head, R.Ll.P.

Ceterach officinarum (L.) Willd.

Down—Near Clough, *B.N.F.C.* 1889-90. Maryfield near Holywood, W. H. Patterson. Ringdufferin, J. Wilson. Larchfield near Legacurry, J. H. Davies. Ardilea House near Dundrum, R.Ll.P.

Antrim—Glenmore near Lisburn, J. H. Davies. Bridge in Glendun, S. A. Brenan.

Derry—Wall at Prehen near Londonderry, Mrs. Bernard.

The prevailing form in the district is var. *crenatum* Milde; the type is apparently rare.

Blechnum spicant Roth. To 2449 feet on the Mournes, S. & P.

Pteris aquilina L. To 1450 feet on the Mournes, Hart *R.I.A.*; 1400 feet on the Mournes, S. & P.

Adiantum capillus-veneris L. A sheet of small fronds in Mr. Hanbury's herbarium is labelled "Morne Mns., Co. Down, Ireland." There is no date or collector's name. The sheet has no history, and comes from some old herbarium.

Hymenophyllum tunbridgense (L.) Sm. Ferguson's and Dickie's Mourne plants must have been *H. unilaterale*, S. &. P.

H. unilaterale Willd. To 1750 feet on the Mournes, Hart *R.I.A.*; 150—1500 feet on the Mournes, S. & P.

Down—Some additional Mourne Mountain localities are given by S. & P.

Osmunda regalis L.

Down—West side of Slieve Bingian, and by the Causeway water; still at Bloody Burn and sea-cliffs south of Newcastle; apparently extinct by the Glen River, S. & P.

Antrim—Island of Rathlin, sparingly, and on boggy ground along the side of Portmore Lough, Herb. D.M. Near Whitehall at Broughshane, S. A. Brenan. Still lingers by Lough Neagh at Shane's Castle, R.Ll.P.; S.A.S., *I.N.* 1894.

Derry—By Lough Bran above Maghera, R.Ll.P. Bog two miles east of Kilrea, R.Ll.P.

Botrychium lunaria (L.) Sw.

Down—Bloody Bridge, S. & P. Conlig Hill, R.Ll.P. Tonaghmore Hill near Saintfield, D. Redmond.

Antrim—Rathlin Island, R.Ll.P., *B.N.F.C.* 1889-90. Glenariff, S. A. Brenan. Summit of Binnagee near Carnlough, R.Ll.P.

Ophioglossum vulgatum L.

Down—Rostrevor, S. & P. Saintfield, C.H.W. Loughbrickland, H.W.L. Clandeboye demesne, R.Ll.P.

Antrim—Glenmore near Lisburn, J. H. Davies. Glenballyemon, S. A. Brenan. Langford Lodge and Binnagee, R.Ll.P.

Derry—Kilrea, Mrs. Leebody.

MARSILEACEÆ.

Pilularia globulifera L.

Antrim—Drain, side of Portmore Lough, Herb. D.M.

LYCOPODIACEÆ.

Isoetes lacustris L. 1100-1350 feet [not 1500] in the Mournes, S. & P Descends to less than 50 feet in Antrim (Lough Neagh, D.M.).

Down—Blue Lough and Lough Shannagh, S. & P.

Antrim—Shore of Lough Neagh near Toome Bridge and Selchin, and at Lady Bay in parish of Glenavy, Herb. D.M. Craigfad Lough above Carnlough, R.Ll.P.

Lycopodium clavatum L.

Down—One plant on Slieve Donard at 2450 feet, S. & P. Slieve Commedagh, H.W.L.

Antrim—Skerry, Herb. D.M. Evish Mountain near Parkmore, and Glenleslie near Clogh, H.W.L. Summit of Knocklayd, R.Ll.P.

Derry—Crockmore above Draperstown, R.Ll.P., *Journ. Bot.* 1892.

L. alpinum L. 1900-2796 feet on the Mournes, S. & P.

Down—On most of the Mourne summits, S. & P.

Antrim—Near Retreat, S. A. Brenan. Cloughcor above Glenariff, H.W.L. Summit of Trostan, and of Little Trosk above Carnlough, R.Ll.P.

L. selago L. To 2796 feet on the Mournes, S. & P.

Selaginella spinosa Beauv. To 2020 feet on the Mournes, Hart *R.I.A.* 0-2000 feet on the Mournes, S. & P.

Down—Common on the Mournes, S. & P.

CHARACEÆ.

Chara fragilis Desv.

Down—Co. Down [Loughinisland], S.A.S.; H. & J. Groves *Journ. Bot.* 1890. Warrenpoint town reservoir, S. & P. Ballyward Lake and Castlewellan Lake, S.A.S. Bull's Eye near Downpatrick, Clandeboye lakes, Conlig Hill, and Ballygowan quarries, R.Ll.P.

Antrim—Lough Neagh, D. Moore; Groves *I.N.* Boghole above Carnlough, R.Ll.P.

var. **barbata** Gant.

Down—Holywood Hills, R.Ll.P.; Groves *I.N.* South side of Tardree Hill, Herb. Canon Grainger. Clandeboye lower lake, and near Craigauntlet, R.Ll.P.

Antrim—Lough Beg [Portmore Lough], W. Thompson; Groves *I.N.*

var. **Hedwigii** Kuetz.

Down—Holywood Hills, R.Ll.P.; Groves *I.N.*

var. **delicatula** Braun.

Antrim—Ram's Island, H.W.L.

C. aspera Willd.

Down—Money Lake, R.Ll.P.

Antrim—Rathlin, Hb. D. Moore; Groves *I.N.* Lough Beg, R.Ll.P.; Groves *I.N.* (abundant at north end of the lake, R.Ll.P.). In Lough Neagh near Shane's Castle, R.Ll.P.

Derry—Lough Beg, R.Ll.P.; Groves *I.N.*

var. **lacustris** H. & J. G.

Antrim—Lough Neagh, Crumlin, S.A.S.; Groves *I.N.*

var. **subinermis** Kuetz.

Antrim—Rathlin Island, D. Moore; Groves *I.N.* Ram's Island, H.W.L.

Derry—River Bann [below Coleraine], R.Ll.P.; Groves *I.N.*

C. contraria Kuetz.

Down—Clandeboye Lake, R.Ll.P., *B.N.F.C.* 1892-3.

Derry—Brackish pools at Limavady Junction, R.Ll.P. and W. D. Donnan; R.Ll.P., *B.N.F.C.* 1890-1.

C. hispida L.

Down—Downpatrick, R.Ll.P.; Groves *I.N.* It grows here in Money Lake and in the Bull's Eye, R.Ll.P.

Derry—R. Bann, Coleraine, D. Moore; Groves *I.N.* Magilligan, Mrs. Leebody.

var. **rudis** Braun.

Down—Money Lake, R.Ll.P.

C. vulgaris L.

Down—Downpatrick, and Clandeboye Lakes, R.Ll.P.

Antrim—In Lough Neagh south of Shane's Castle, R.Ll.P.

Derry—Magilligan, Mrs. Leebody; Groves *I.N.*

var. **longibracteata** Kuetz.

Down—Co. Down [Victoria Park], S.A.S.; H. & J. Groves, *Journ. Bot.* 1890. Blackstaff Bridge near Kirkcubbin, R.Ll.P.

Antrim—Springfield, W. M. Hind; Groves *I.N.*

Nitella translucens Ag.

Down—Pool on Conlig Hill, W. D. Donnan. Very abundant in a small lake in Clandeboye demesne, R.Ll.P.

Antrim—Lissanorn Castle, D. Moore; Groves *I.N.*

Derry—Kilrea, D. Moore; Groves *I.N.* (still there, R.Ll.P.). Enagh Lough, Mrs. Leebody. Killelagh Lough above Maghera, R.Ll.P.

N. opaca Ag.

Down—Tollymore Park, Burren River, Lough Island Reavy, and by Bann above Hilltown, S. & P. Money Lake and Ballygowan quarries, R.Ll.P.

Antrim—Ram's Island, H.W.L. Six-mile River at Templepatrick, S.A.S.

Derry—Kilrea, W. Thompson; Groves *I.N.* Racecourse bog near Londonderry, Mrs. Leebody. Killelagh Lough above Maghera, R.Ll.P.

MUSCI.

ANDREÆACEÆ.

Andreæa crassinervis Bruch.
Down—Eagle Mountain, C.H.W.; Lett *R.I.A.*

A. rupestris (L.) Roth.
Down—Summit of Slieve Bignian, H.W.L.
var. **falcata** Schimper.
Down—Rocky Mountain near Hilltown, C.H.W.
var. **hamata** Lindb.
Down—Slieve Commedagh and Slieve Dermot, H.W.L.

POLYTRICHACEÆ.

Oligotrichum incurvum (Huds.) Lindb.
Down—Devil's Brewing Pan at Mourne Mountains, Templeton MSS.
Antrim—Gravelly heath above Cave Hill Deerpark, C.H.W.

Polytrichum urnigerum Linn.
Derry—Garvagh, S. A. Brenan; H.W.L.

P. attenuatum Menz.
Down—Drumsallagh, Aghaderg, H.W.L. 1889. Saintfield demesne, C.H.W. & H.W.L.

DICRANACEÆ.

Pleuridium axillare (Dicks.) Lindb.
Down—Abundant in stubble fields, and by the lake shore at Loughbrickland, H.W.L.

P. subulatum (Huds.) Raben.
Down—Warrenpoint, C.H.W. Scarva, H.W.L.
Antrim—Glendun, S. A. Brenan; H.W.L.

Ditrichum homomallum (Hedw.) Hampe.
Antrim—Glenariff, H.W.L.

Anisothecium crispum (Schreb.) Lindb. var. **β. elatum.**
Antrim—Cushendall, H. N. Dixon, *Journ. Bot.* 1891.
Seems to be the only Irish locality for this variety.

A. rubrum (Huds.) Lindb.
Down—Deer's Meadow and Rocky Mountain, Lett *R.I.A.*

A. rufescens (Dicks.) Lindb.
Down—Abundant on shores of Loughbrickland, H.W.L.

A. squarrosum (Starke) Lindb.
Antrim—Slievenanee and Glenballyemon, H.W.L.

Campylopus flexuosus (L.) Brid.
Antrim—Cloughcor near Glenariff, H.W.L.

C. setifolius Wilson.
Down—Pigeon Rock Mountain, Lett *R.I.A.*

Dicranoweissia cirrata (L.) Lindb.
Antrim—On thorn bushes in Cave Hill Deerpark, C.H.W.

Dicranum majus Sm.
Derry—Lignapeiste Glen, Mrs. Leebody.

D. Bonjeani De Not.
Down—Slieve Dermot, Lett *R.I.A.*
Antrim—Parkmore, H.W.L.

D. fuscescens Turner.
Down—Shanlieve, C.H.W.; Lett *R.I.A.*

D. Scottii Turner.
Down—Hen Mountain, Lett *R.I.A.*

Dichodontium pellucidum (L.) Schimp.
Antrim—Cushendall, H. N. Dixon, *Journ. Bot.* 1891.

D. flavescens (Dicks.) Lindb.
Antrim—Ballycastle, H. N. Dixon, *Journ. Bot.* 1891.

TORTULACEÆ.

Pottia Heimii (Hedw.) Fuern.
Antrim—Giant's Causeway, H. N. Dixon, *Journ. Bot.* 1891.
Derry—Between Portstewart and Bann mouth, H.W.L.

P. Starkei (Hedw.) C. Muell.
Antrim—Ditch-bank at Ballysillan limestone quarries, S.A.S.

Tortula ericæfolia (Neck.) Lindb.
Down—Old quarry at Maralin, H.W.L.
Antrim—Ditch-bank at Ballysillan limestone quarry, S.A.S.

T. papillosa Wils.
Down—Drumsallagh, Aghaderg, H.W.L.

T. princeps De Not.
Antrim—Glenarm Deerpark, D.M.; *Brit. Moss Flora.*
Derry—Benevenagh, S.A.S.; *Brit. Moss Flora.*

Mollia microstoma Lindb.
Down—Near Warrenpoint, C.H.W.; Lett *R.I.A.*
Antrim—Ballycastle, H. N. Dixon, *Journ. Bot.* 1891.

M. æruginosa (Sm.) Lindb.
Antrim—Parkmore and Glenballyemon, H.W.L. Drumnasole, S. A. Brenan; H.W.L.

M. verticillata (L.) Lindb.
Down—Wall of bridge in Tollymore Park, C.H.W.; H.W.L.
Antrim—Glenarm, H. N. Dixon, *Journ. Bot.* 1891.

M. crispula (Bruch) Lindb.
Antrim—Ballycastle, in fruit, H. N. Dixon, *Journ. Bot.* 1891.

M. litoralis (Mitt.) Braith.
Antrim—Cushendall and Ballycastle, H. N. Dixon, *Journ. Bot.* 1891.

M. brachydontia Lindb.
Down—Kinehalla, H.W.L.

M. tenuirostris (Hook. & Tayl.).
Down—Several stations in Mourne Mountains, H.W.L.

M. inclinata (Hed.) Lindb.
Antrim—Portrush, H.W.L.
Derry—Portstewart, H.W.L.

M. tortuosa (L.) Schrank.
Antrim—Drumnasole, S. A. Brenan; H.W.L.

Barbula curvirostris (Ehr.) Lindb.
Down—Cove Mountain, Lett *R.I.A.*

B. spadicea Mill.
Down—Tollymore Park, Lett *R.I.A.*

B. rigidula (Hed.) Mitt.
Antrim—Fairhead, H.W.L.

B. cylindrica (Tayl.) Schimp.
Antrim—Glenballyemon, H.W.L. Cushendall, H. N. Dixon, *Journ. Bot.* 1891.

B. unguiculata (Huds.) var. **γ. apiculata** Hedw.
Down—Wall of Aghaderg Glebe, H.W.L.

Leersia contorta (Wulf.) Lindb.
Antrim—Rocks at upper end of Colin Glen, J H. Davies. Glenballyemon, H.W.L. Glendun, S. A. Brenan; H.W.L.

WEBERACEÆ.

Webera sessilis (Schmid.) Lindb.
Antrim—Slemish Mountain, H.W.L.
Stated in *Flora* to be barren. This was an error, as Mr. Lett finds it fruiting freely from early summer till late in autumn.

GRIMMIACEÆ.

Grimmia funalis (Schwaeg.).
Down—Slieve Dermot, Lett *R.I.A.*

G. orbicularis Bruch.
Down—Top of stone fence on Spelga Mountain, H.W.L.; *Brit. Moss Flora.*
This is the only locality in the North of Ireland known to us.

G. trichophylla Grev.

Down—Fofanny, and Butter Mountain, Lett *R.I.A.* Bryansford, C.H.W., *Brit. Moss Flora.*

Antrim—Basalt rocks at summit of Ballygally Head, S.A.S.

G. Hartmani Schimp.

Antrim—Fairhead, H. N. Dixon, *Journ. Bot.* 1891.

G. Donii Sm.

Down—Granite blocks between Slieve Martin and Kilbroney bog, Lett *R.I.A.*

G. ovata was hastily inserted as an addendum when the *Flora* was at Press. This must be deleted, as it was subsequently ascertained to be an erroneous determination.

G. obtusa (Sm.) Lindb.

Down—Shanslieve, Slieve Donard and Slieve Bingian, Lett; *Brit. Moss Flora.*

G. affinis (Schleich.) Lindb. var. β. **gracilescens** Lindb.

Down—Shanslieve, Lett; *Brit. Moss Flora.*

G. patens (Dicks.) Br. et Schimp.

Antrim—The Craig rocks, Rasharkin, H.W.L.

By inadvertance 2700 was printed in *Flora* for 1200 feet, the highest elevation known to us.

ORTHOTRICACEÆ.

Orthotrichum Sturmii. The Lough Neagh locality of *Flora* must be transferred to *O. striatum.*

Orthotrichum diaphanum Schrad.

Down—Donard demesne and Loughbrickland, H.W.L.

O. cupulatum Hoffm.

Antrim—Glenarm, H. N. Dixon, *Journ. Bot.* 1891.

O. stramineum Hornsch.

Antrim—Fairhead, D.M.; herb. Carrington, *fide* G. A. Holt.

O. rivulare Sm.

Antrim—Ram's Island, J. H. Davies.

O. pulchellum Sm.
Down—On apple trees at Ravernet, J. H. Davies.
Antrim—Parkmore, H.W.L.

Weissia Bruchii (Hornsch.) Lindb.
Antrim—Glenariff, S.A.S. Glendun, S. A. Brenan; H.W.L.

W. vittata (Mitt.) Braith.
Antrim—Glenshesk, 1880, and Glenariff, 1889, S.A.S.; *Brit. Moss Flora.*

SPLACHNACEÆ.

Tetraplodon bryoides (Mitt.) Braith.
Antrim—Glenariff, S. A. Brenan.

FUNARIACEÆ.

Funaria obtusa (Dicks.) Lindb.
Antrim—Sallagh Braes, C.H.W.

F. attenuata (Dicks.) Lindb.
Down—Wet rocks near Donaghadee, J. H. Davies.
Antrim—Islandmagee, J. H. Davies.
Derry—Benbradagh Mountain, Mrs. Leebody.

It is to be regretted that the name of Templeton, our pioneer botanist, which was associated with this plant by Smith in 1813, has to be replaced by a prior term.

F. calcarea Wahlenb.
Antrim—Near Carrick-a-rede, H. N. Dixon, *Journ. Bot.* 1891.

BRYACEÆ.

Leptobryum pyriforme (L.) Wils.
Down—Abundant on flower-pots at Aghaderg, H.W.L.

Pohlia acuminata Hornsch.
Down—Wet rocks at Blackstairs, Slieve Donard, and on Spaltha Mountain, Lett *R.I.A.*

P. nutans (Schreb.) Lindb. var. **longiseta** Brid.
Down—County Down [Cotton Moss], S.A.S.; *Brit. Moss Flora.*

P. annotina (L.) Lindb.
Down—Shanlieve, S.A.S Slieve Bingian, Lett *R.I.A.*

P. albicans (Wahl.) Lindb.
Down—Wayside well near Fofanny, Lett *R.I.A.*

Plagiobryum Zierii (Dicks.) Lindb.
Antrim—Sallagh Braes, C.H.W.

Bryum inclinatum (Swartz) Bland.
The station in Victoria Park assigned to this species was an error, the plant having subsequently been decided to be *B. intermedium.*

Bryum Mildei Juratz.
Antrim—Slemish Mountain, Moore; *Brit. Moss Flora.*

B. alpinum Huds.
Down—White River Glen, Lett *R.I.A.* Fruiting very sparingly in Mourne Mountains, S.A.S., July, 1888.
Antrim—Rasharkin bog, H.W.L. & C.H.W.

B. pallens Swartz.
Down—Slieve Donard, Lett *R.I.A.*
Antrim—Parkmore, H.W.L.

B. ventricosum Dicks.
Down—Leitrim near Hilltown, and frequent in the Mourne Mountains, Lett *R.I.A.*
Antrim—Near Parkmore, H.W.L. By the stream in Glenshesk, in fine fruit, J. H. Davies.
Derry—Lignapeiste Glen, Mrs Leebody.

B. proliferum (L.) Sibth. (*B. roseum* Dill.).
Down—Newcastle, C.H.W.

BARTRAMIACEÆ.

Bartramia pomiformis (L.) Hedw.
Antrim—Drumnasole, S. A. Brenan; H.W.L.

B. norvegica (Gunn.) Lindb.
Antrim—Fruiting in Glenariff, H.W.L.

B. fontana (L.) Swartz var. β. **falcata** Brid.
Antrim—Rasharkin, H.W.L. & C.H.W.

MNIACEÆ.

Gymnocybe palustris (L.) Fries.
Antrim—Glendun, S. A. Brenan; H.W.L.
Aulacomnium and *Sphærocephalus* must give way to the prior name of Fries.

Mnium riparium Mitt.
Antrim—A few barren stems intermixed with other mosses in wet bog at Glenariff, H.W.L.
The only Irish locality known at present.

M. cuspidatum (L.) Neck.
Antrim—Wet ditch at Hightown, Carnmoney, C.H.W.

M. pseudopunctatum Bruch & Schimp.
Antrim—Parkmore, H.W.L.

HYPNACEÆ.

Leskea polycarpa Ehr.
Down—Loughbrickland, H.W.L.

Anomodon viticulosus (L.) Hook. & Tayl.
Antrim—Fruiting at Drumnasole, S. A. Brenan; H.W.L.

Hypnum filicinum Linn.
Antrim—Glendun, S. A. Brenan; H.W.L.

H. confervoides Bridel.
Derry—Sandy warren at Portstewart, S.A.S., 1884.
The only Irish station.

H. irriguum Wils.
Down—Rocky stream in Drumbo Glen, S.A.S.
Doubtfully mentioned in excluded list of *Flora*.

H. riparium Linn.
Down—Shore of Loughbrickland, H.W.L.
Antrim—By the Lagan near Glenmore, J. H. Davies. Pond by railway line north of Kilroot, S.A.S. Parkmore, H.W.L.

H. stellatum Schreber.
Down—Stormount Glen, and marsh on Conlig Hill, S.A.S.

Antrim—Glendun, S. A. Brenan; H.W.L. Abundant in Rasharkin bog, H.W.L.

H. fluitans Linn.

Antrim—Parkmore and Lurgethan, H.W.L. Glendun, S. A. Brenan; H.W.L.

H. Kneiffii Br. & Schimp.

Down—Near shore of Lough Neagh at Kilmore, C.H.W. Loughbrickland, H.W.L.

H. revolvens Swartz.

Down—Slieve Dermot, Lett *R.I.A.*

Antrim—Glenballyemon, H.W.L.

Derry—Marshes in Portstewart sandhills, S.A.S.

H. scorpioides Linn.

Down—Margin of Ballyward Lake and of Pollramer Lake, and in fruit in a marsh on Conlig Hill, S.A.S.

Antrim—Glenariff and Glendun, H.W.L.

H. ochraceum Turner.

Antrim—Glenariff, H.W.L.

H. sarmentosum Wahl.

Down—Shanslieve, Lett *R.I.A.*

H. Swartzii Turner.

Antrim—Glendun, S. A. Brenan; H.W.L.

H. speciosum Brid.

Antrim—Knockagh, C.H.W.

H. crassinervum Tayl.

Antrim—Knockagh, and on wall at Carnmoney, and on limestone blocks in Cave Hill Deerpark, C.H.W. Glenariff, H.W.L.

H. piliferum Schreb.

Down—Tollymore Park, C.H.W.

Antrim—Glendun, S. A. Brenan; H.W.L.

H. tenellum Dicks.

Down—Greenhouse at Aghaderg Glebe, H.W.L. Wall of bridge in Tollymore Park, Lett *R.I.A.*

Antrim—Walls about Coole Glebe, Carnmoney, C.H.W. Parkmore, H.W.L. Drumnasole, S. A. Brenan; H.W.L.

H. flagellare Dicks.

Down—Rocks by the river at Tollymore Park, Templeton (spec. in herb. Belf. Mus.). Slieve Donard, Slieve Commedagh, and frequent in the Mourne range, but always barren, S.A.S., *Suppl. to Mosses of N.E. Ireland.* Tollymore, Yellow Water, &c., frequent, C.H.W. Common throughout the Mourne range, Lett *R.I.A.*

Antrim—Glenariff, H.W.L.

Localities for this species were published in *Supplement to Mosses of North-East Ireland*, but accidentally omitted from *Flora.*

H. heteropterum (Bruch).

Down—Slieve Bingian and Slieve Meel Beg, Lett *R.I.A.* Rostrevor Mountain, C.H.W.

Antrim—Slemish Mountain, H.W.L. & C.H.W.

In following Moore and giving *H. atrovirens* Turner as a synonym for "*H. heteropteron*," the authors of the *Flora* were in error, as Mr. Lett has pointed out to us. Moore's second synonym, *H. catenulatum*, is likewise erroneous.

H. cupressiforme Linn. var. **lacunosum** Wils.

Down—Slievenabrock, Lett *R.I.A.*

H. resupinatum Wils.

Down—Slieve Donard, H.W.L.

H. Patientiæ Lindb.

Down—Saintfield, C.H.W.

Antrim—Glendun, S. A. Brenan; H.W.L. Carnmoney and Hydepark, widely distributed, C.H.W.

H. Borreri Spruce.

Down—Saintfield, C.H.W. Sandy bank at Knocknagoney, S.A.S.

Antrim—Slemish and Sallagh Braes, C.H.W.

H. pulchellum Dicks.

Down—Tollymore Park, C.H.W.

Antrim—Glenariff, C.H.W. & H.W.L.

H. undulatum Linn.

Antrim—Parkmore, H.W.L.

Derry—Benbradagh Mountain, Mrs. Leebody.

H. sylvaticum Linn.
Down—Slieve Donard, Lett *R.I.A.*

H. denticulatum Linn.
Down—Chimney Rock Mountain, Lett *R.I.A.* In a small glen close to Dundonald station, S.A.S.

SPHAGNACEÆ.

Sphagnum Austini Sulliv.
Antrim—Evish Mountain near Parkmore, H.W.L., 1889.
Mr. Lett, who was the first to find this plant in Ireland, has subsequently (1892) met with it in King's County.

S. papillosum Lindb.
Down—Common in Mourne Mountains, Lett *R.I.A.*
Antrim—Parkmore, H.W.L. Glendun, S. A. Brenan; H.W.L.

S. tenellum Ehr.
Antrim—Glendun, S. A. Brenan; H.W.L.

S. subsecundum Nees & Von Es.
Antrim—Crockalough near Parkmore, H.W.L.
var. **obesum** Wilson.
Derry—Racecourse bog at Ballyarnot, Mrs. Leebody.

S. rigidum Nees & Von Es. var. β. **compactum** DC.
Antrim—Parkmore, Crockalough, and Rasharkin bog, H.W.L. Glendun, S. A. Brenan; H.W.L.

S. teres Angst.
Down—Hen Mountain, Lett *R.I.A.*
The only Irish station known at present.

S. acutifolium Ehr.
Antrim—Glendun, S. A. Brenan; H.W.L.
A number of varieties of this polymorphic species occur.

S. intermedium Hoffm.
Antrim—Parkmore, H.W.L.

S. cuspidatum Ehr.
Down—Rostrevor Mountain, C.H.W.; Lett *R.I.A.*
Antrim—Parkmore and Glenballyemon, H.W.L.
var. **plumosum** Nees & Hsch.
Antrim—Glendun, S. A. Brenan; H.W.L.

HEPATICÆ.

JUNGERMANNIACEÆ.

Frullania fragilifolia Tayl.
Antrim—"The Craigs," Rasharkin, H.W.L. & C.H.W. Glenariff, H.W.L.

Lejeunea hamatifolia Hook.
Antrim—Glenariff, C.H.W.

L. calcarea Libert.
Antrim—Glenariff, H.W.L. and C.H.W.

L. ovata (Dicks.) Tayl.
Antrim—Glenariff, C.H.W.

L. microscopica Tayl.
Antrim—Glenariff, C.H.W.

L. patens Lindb.
Antrim—On *Neckera crispa* at Sallagh Braes, H.W.L

L. Mackaii (Hook.) Spreng.
Down—On an old yew tree in Tollymore Park, C.H.W.; Lett *R.I.A.*
Antrim—Limestone rocks in Redhall Glen, 1809, Templeton. Gobbin cliffs, C.H.W. Glenariff, H.W.L.

Porella rivularis Nees.
Down—Saintfield, C.H.W.

Pleurozia purpurea (Lightf.) Dum.
Antrim—Rasharkin bog, H.W.L. & C.H.W. Evish Mountain, H.W.L.

Trichocolea tomentella (Ehr.).
Down—By a rivulet in Belvoir Park, Templeton.
Antrim—Glendun, S. A. Brenan; H.W.L.

Lepidozia setacea (Web.) Dum.
Down—Hen Mountain, Lett *R.I.A.* Tollymore Park, H.W.L.
Antrim—Glendun, S. A. Brenan; H.W.L. Rasharkin bog, H.W.L.

Bazzania trilobata (L.) Gray.
Down—Tollymore Park, Templeton.

Odontoschisma sphagni (Dicks.).
Down—Tollymore Park and Cock Mountain, C.H.W.; Lett *R.I.A.*
Antrim—Cloughcor near Parkmore, H.W.L.

Cephalozia divaricata (Sm.).
Down—Hen Mountain and bog between Hilltown and Rathfriland, Lett *R.I.A.* Tollymore Park, C.H.W.
Antrim—Parkmore, H.W.L.

This was probably the plant noted by Templeton as *C. byssacea*, occurring at Lambeg, Cranmore, etc.

C. connivens (Dicks.) Spruce.
Down—Slievenamady, Lett *R.I.A.*

Kantia trichomanis (Linn.).
Down—Bog near Ballynahinch, H.W.L.
Antrim—Glendun, S. A. Brenan; H.W.L. Parkmore and Lurgethan, H.W.L.

Scapania nemorosa (L.) Dum.
Down—Saintfield, frequent, C.H.W.
Antrim—Glendun, S. A. Brenan; H.W.L. Lurgethan, H.W.L.

S. resupinata (L.) Dum.
Antrim—Fairhead and Glendun, in company with Taylor, Hooker, and Stokes, Templeton.

S. umbrosa (Schrad.) Dum.
Down—Hen Mountain, H.W.L.

S. curta (Mart.) Dum.
Down—Ballyvarley bog, Aghaderg, H.W.L.

Chiloscyphus polyanthos (L.) Corda.
Down—Aghaderg Glebe and Ballyvarley bog, H.W.L.
Antrim—Slemish, Templeton. Glendun, S. A. Brenan ; H.W.L.

Leptoscyphus interruptus Nees var. β. **pyrenaicum** Spruce.
Down—Roadside wall south of Rostrevor quay, H.W.L.

Plagiochila spinulosa (Dicks.) Dum.
Antrim—Gobbin cliffs, C.H.W. Drumnasole and Rasharkin bog, H.W.L.

P. tridenticulata (Tayl.).
Antrim—Drumnasole, S. A. Brenan; H.W.L.

Jungermannia riparia Tayl.
Down—Cove Mountain, Lett *R.I.A.*
Antrim—Colin Glen, C.H.W. Drumnasole and Glendun, S. A. Brenan; H.W.L. Glenariff and Rasharkin bog, H.W.L.

J. crenulata Sm. var. **gracillima** Sm.
Down—Tollymore Park and Slieve Commedagh, Lett *R.I.A.* Aghaderg, H.W.L.

J. pumila With.
Antrim—Glendun, S. A. Brenan; H.W.L. Slievenanee, H.W.L.

J. sphærocarpa Hook.
Antrim—Colin Glen, 1818, Templeton. Parkmore, H.W.L.

J. barbata Schreb. (Coll.).
Antrim—Rasharkin bog and Slemish Mountain, H.W.L.
Given by Mr. Lett as *J. barbata* var. *quinquedentata*, but Schreber's species seems inseparable from *quinquedentata* Hudson.

Nardia sphacelata Giesecke.
Down—Slieve Donard, J. J. Andrew; H.W.L.

N. hyalina (Lyall) Carring.
Down—Cove Mountain and Hen Mountain, H.W.L.
Antrim—Parkmore, H.W.L.

Cesia crenulata (Gottsche) Carring.
Antrim—Shady rocks on north-east side of Slemish, H.W.L. & C.H.W.

Pellia calycina (Tayl.).
Down—Aghaderg, H.W.L.
Antrim—Drumnasole, S. A. Brenan; H.W.L. Parkmore, H.W.L.

Aneura pinguis (L.) Dum.
Derry—Portstewart, S.A.S.

A. multifida (Dill.) Gray.
Down—Loughbrickland, H.W.L.
Antrim—Seymour Hill, Templeton.

MARCHANTIACEÆ.

Preissia commutata Nees.
Down—Scarva demesne, H.W.L.
Antrim—Parkmore, H.W.L. Glendun, S. A. Brenan; H.W.L.

Lunularia cruciata (Linn.) Dum.
Down—Drumcro, C.H.W. Aghaderg, H.W.L.
Antrim—Moss hole at Seymour Hill, Templeton, 1806. East end of Belfast Botanic Gardens, H.W.L.

RICCIACEÆ.

Riccia fluitans Linn.
Down—Abundant in a drain at Meenan bog, Loughbrickland, H.W.L.

ANTHOCEROTACEÆ.

Anthoceros punctatus Linn.
Down—Clover and stubble fields in Parish of Aghaderg, H.W.L.
Antrim—Belfast Botanic Gardens and river bank in Glendun, H.W.L.

ERRONEOUS OR DOUBTFUL HEPATICS.

The following hepatics, quoted from the Templeton MSS., have been deemed too doubtful for insertion in the foregoing list. While the greater part are certainly errors, it is probable that some may yet be verified, and with this view they are now made public :—

Porella thuja. On the rock at the waterfall in Woodburn Glen, 31st March, 1807.

Cephalozia curvifolia. Rock crevices on Bingian Mountain.

C. byssacea. Lambeg, Cranmore, and Birky moss.

Harpanthus scutatus. Glen below Rockport.

Plagiochila tridenticulata. Common on the rocks of the Cave Hill.

Mylia anomala. Annahilt bog and summit of Divis. [Perhaps the same plant as his *M. Taylori.*]

Jungermannia cuneifolia. Near top of Divis.

J. pumila. Common on bare ground about Belfast.

J. barbata. Common in the recumbent state on the rocks about the Cave Hill; also on Divis Mountain, and in Ness Glen.

J. exsecta. With the next species on Holywood Warren.

J. excisa. Divis and Black Mountain, and on Holywood Warren.

J. incisa. Lambeg. Moor halfway between Holywood and Bangor, and rocky bank above the Manyburn at Purdysburn racecourse.

Nardia compressa. Near Belfast.

In the foregoing list Templeton's nomenclature, which was that current in his time, has been replaced by names now adopted.

ADDENDA ET CORRIGENDA.

p. 135. Add *Grimmia ovata* to the list of plants to be withdrawn from *Flora*.

p. 139. *Sparganium neglectum* was recorded prematurely; on referring the specimen to the describer of that form, it was named by him *S. ramosum* var. *microcarpum*, and is recorded under that name in the body of the Supplement, p. 201.

pp. 142-3. A number of specimens of cryptogams have been examined and verified since the first portion of the manuscript went to press, and the following have to be placed to lists of additions in the Introduction.

DISTRICT 12.

Hypnum confervoides.
H. flagellare.
Bryum Mildei.

COUNTY DOWN.

Hypnum flagellare.

COUNTY ANTRIM.

Tortula princeps.
Hypnum flagellare.
Bartramia norvegica.

COUNTY DERRY.

Hypnum confervoides.
H. revolvens.
Funaria attenuata.
Aneura pinguis.

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A BIBLIOGRAPHY OF IRISH GLACIAL AND POST-GLACIAL GEOLOGY.

BY

R. LLOYD PRAEGER, B.E.

Being an Appendix (No. 6 of Vol. 2) to the Proceedings of the

BELFAST NATURALISTS' FIELD CLUB

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A BIBLIOGRAPHY

OF

IRISH GLACIAL AND POST-GLACIAL GEOLOGY.

THE following list of books, papers, and notes bearing on the glacial and post-glacial geology of Ireland had but a small beginning. It originated in a few dozen references to records of post-glacial fossils in the North-east of Ireland, thrown together for my own convenience. This list was added to by degrees, accumulating according to the manner of a snowball, each paper giving references to a number of others. Eventually, it appeared to me that if the list could be extended, completed, and published, it might prove a saving of time and labour to other workers; and in this thought I had especially in my mind the energetic members of the Geological Section of the Belfast Naturalists' Field Club, who have not convenient access to many of the journals, &c., quoted below, and on whom Prof. Cole recently urged[1] the importance of getting together their local geological literature.

In order to complete the list, systematic work was necessary, and sets of Periodicals and Proceedings of Societies which might contain references to Irish geology had to be carefully gone through. This portion of the work proved more extensive and tedious than was expected, and indeed had I known how much time it would involve, it is doubtful if the present effort would have seen the light. But in spite of time and care, I am well aware that my list must contain many omissions, though it is hoped that none of them are serious ones. Geologists working at any branch of the subjects included in the present compilation, or at the geology of any particular district, are nearly sure, among the scattered records of Irish geology, to unearth some references which, in my necessarily hurried work, have escaped notice. To them I would appeal to favour me with a note of such references, in order that, by the publication of a supplement, the present attempt may justify its title, and become a complete guide to the literature of Irish glacial and post-glacial geology.

As to the scope of the present list. Although believed to be of Pliocene, not Pleistocene age, the so-called "manure gravels" of Wexford have been included. They are the only marine Tertiary beds in Ireland, and are moreover of late Pliocene age, possessing a fauna distinctly related to that of the incoming glacial period; when to these is added the fact that the literature relating to the Wexford beds is much mixed up with that of the succeeding series, the advantage and convenience of this inclusion will be apparent. In view of recent papers in the *Irish Naturalist* on caves, and Dr. Scharff's bibliography of that subject, references to caves have been included, even if these references had no distinctly geological bearing; for much cave-exploration remains to be carried out in Ireland, as to both their past and present fauna; and a list of localities is therefore a desideratum.

In dealing with the human period, a difficulty constantly presented itself as to

[1] *Irish Naturalist*, IV., 49. 1895.

how far papers on the remains of pre-historic man were admissible in a geological bibliography. Thus, while a flint implement found in the stratified marine gravels of Antrim, or a bronze celt in a stalagmitic deposit, are objects of distinct geological interest, the same cannot be said of a cinerary urn found in a kist, or a flint arrow-head which the urn may have contained. But it is difficult to draw the line, for geology and archæology not only meet, but overlap. The rule which I have endeavoured to follow is to admit papers which describe the *mode of occurrence* or *stratigraphical position* of human relics, and to omit papers dealing with objects artificially buried, or merely with the affinities or ornament of objects found. Thus sand-hill sites, crannogs, cave-deposits, and flint implement gravels are included; but papers on such subjects shade imperceptably into others which are purely ethnographical in their bearing.

In the way of existing bibliographies there was very little to assist me. The only papers giving even a tolerably complete bibliography of any part of the subjects included in the present paper, or of any district, were Dr. V. Ball's list of papers on Irish fossil mammals (**39**)* and Mr. Hardman's list of papers on North of Ireland geology (**251**). The shorter lists of papers given by Adams (**5, 6**), Close (**129**), Cole (**136**), Gray (**232**), Hull (**297**), M'Henry (**492**), and Scharff (**607**), were of course consulted. I made a point of verifying every reference by consultation of the original publication, where possible; the few papers (4 out of the 767 which have a place in the list) which I was not able to consult are distinguished by an asterisk.

Subjoined are particulars relating to Proceedings of Societies and to Journals systematically examined for references to the subject included in the list, the contracted titles used in the list being added in parenthesis:—

ACADEMIES' PROCEEDINGS, &c.

British Association for the Advancement of Science:

Reports, years 1—64, 1831-1894. (*Brit. Assoc. Reports.*)

Geological Society of London:

Quarterly Journal, I.—LI., 1845-1895. (*Q.J.G.S.*)

Geologists' Association, London:

Proceedings, I.—XIV. pt. 5, 1859-1895. (*Proc. Geol. Assoc.*)

Anthropological Institute:

Journal, I.—XXV. pt. 2, 1871-1895. (*Journ. Anthrop. Inst.*)

Geological Survey of Ireland:

Memoirs, 120 parts, 1858-1891. 8vo.

Royal Irish Academy:

Proceedings, I.—X., 1836-1870; 2nd s. (*Science*), I.—IV., 1869-1888; 2nd s. (*Polite Literature and Antiquities*), I.—II., 1870-1888; 3rd s., I.—III. pt. 4, 1887-1895. 8vo. (*Proc. R.I.A.*)

Transactions, I.—XXX. pt. 17, 1785-1895. 4to. (*Trans. R.I.A.*)

Royal Dublin Society:

Journal, I.—VII., 1856-1878. 8vo. (*Journ. R.D.S.*)

Scientific Proceedings, n.s., I.—VIII. pt. 4, 1878-1895. 8vo. (*Sci. Proc. R.D.S.*)

* The numbers refer to the index numbers in the general list.

Scientific Transactions, 2nd s., I.—V. pt. 11, 1877-1895. 4to. (*Sci. Trans. R.D.S.*)

GEOLOGICAL SOCIETY OF DUBLIN:

Journal, I.—X., 1833-1864. (*Journ. G.S.D.*)

ROYAL GEOLOGICAL SOCIETY OF IRELAND (previously Geological Society of Dublin):

Journal, I.—VIII. (XI.—XVIII. of whole series), 1864-1889. (*Journ. R.G.S.I.*)

DUBLIN NATURAL HISTORY SOCIETY:

Proceedings, I.—VI., 1849-1870. (*Proc. Dublin Nat. Hist. Soc.*)

BELFAST NATURALISTS' FIELD CLUB:

Reports, 1—10, 1863-4—1872-3. (*Ann. Reports B.N.F.C.*)

Annual Reports and Proceedings, 2nd s., I.—IV. pt. 2, 1873-4—1894-5. (*Proc. B.N.F.C.*)

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY:

Proceedings, 11 vols., 1871-2—1881-2.

Reports and Proceedings, 13 vols., 1882-3—1894-5. (*Proc. B.N.H. & P.S.*)

CORK HISTORICAL AND ARCHÆOLOGICAL SOCIETY:

Journal, I.—III., 1892-1894; and n.s.I., 1895. (*Journ. Cork Hist. & Arch. Soc.*)

KILKENNY ARCHÆOLOGICAL SOCIETY:

Transactions, I.—II., 1849-1853. (*Trans. Kilk. Arch. Soc.*)

Proceedings and Transactions, III., 1854-1855. (*Proc. and Trans. Kilk. Arch. Soc.*)

KILKENNY AND SOUTH-EAST OF IRELAND ARCHÆOLOGICAL SOCIETY:

(Previously Kilkenny Archæological Society.)

Journal, n.s., I.—VI., 1856-1867. *Journ. Kilk. & S.E. Ireland Arch. Soc.*)

HISTORICAL AND ARCHÆOLOGICAL ASSOCIATION OF IRELAND:

(Previously Kilkenny & S.E. Ireland Arch. Soc.)

Journal, 3rd s., I., 1868-1869. (*Journ. H. & A.A.I.*)

ROYAL HISTORICAL AND ARCHÆOLOGICAL ASSOCIATION OF IRELAND:

(Previously Hist. & Arch. Assoc. of Ireland.)

Journal, 4th s., I.—IX., 1870-1889. (*Journ. R.H. & A.A.I.*)

ROYAL SOCIETY OF ANTIQUARIES OF IRELAND:

(Previously R. Hist. & Arch. Assoc. of Ireland.)

Proceedings and Papers, 5th s., I., 1890-1891. (*Proc. and Papers R.S.A.I.*)

Journal, 5th s., II.—V., 1892-1895. (*Journ. R.S.A.I.*)

JOURNALS, &c.

Geological Magazine:

Decade 1, vol. I. to decade 4, vol. II., 1864-1895. (*Geol. Mag.*)

Geologist, The :
From 1858 to 1864.

Glacialists' Magazine :
I.—III. pt. 3, 1893-1895.

Geological Record :
From 1874 to 1884.

Annals of British Geology :
From 1890 to 1894.

Natural History Review :
I.—VII., 1854-1860; and n.s., I.—V., 1861-1865. (*Nat. Hist. Review.*)

Dublin Quarterly Journal of Science:
I.—VI., 1861-1866. (*Dublin Q.J.S.*)

Dublin Philosophical Journal and Scientific Review :
I.—II., 1825-1826. (*Dublin Phil. Journ. & Scient. Review.*)

Irish Naturalist :
I.—IV., 1892-1895. (*I.N.*)

Ulster Journal of Archæology :
I.—IX., 1853-1862.
New Issue, I., 1894-95. (*Ulst. Journ. Arch.*)

About a hundred books on geology, archæology, topography, &c., which contained, or might have contained, references to the subjects in hand, were likewise looked through.

Occasional references were also made to the following :—

ACADEMIES' PROCEEDINGS, &c :—

Royal Society of London :
Philosophical Transactions. (*Phil. Trans.*)

Geological Survey of Great Britain :
Memoirs.

Palæontographical Society :
(*Publications.*)

Geological Society of London :
Proceedings. (*Proc. Geol. Soc. London.*)

Zoological Society of London :
Proceedings. (*Proc. Zool. Soc. London.*)

Society of Antiquaries of London :
Proceedings. (*Proc. Soc. Ant. London.*)

Manchester Geological Society :
Proceedings. (*Proc. Manchester Geol. Soc.*)

LITERARY AND PHILOSOPHICAL SOCIETY OF MANCHESTER:
Proceedings. (*Proc. Lit. & Phil. Soc. Manchester.*)

LIVERPOOL GEOLOGICAL SOCIETY:
Proceedings. (*Proc. L'pool Geol. Soc.*)

GEOLOGICAL AND POLYTECHNIC SOCIETY OF THE WEST RIDING OF YORKSHIRE:
Proceedings. (*Proc. Geol. & Polytechnic Soc. of W. Riding of Yorks.*)

SOCIETY OF ANTIQUARIES OF SCOTLAND:
Proceedings. (*Proc. Soc. Ant. Scotland.*)

EDINBURGH GEOLOGICAL SOCIETY:
Transactions. (*Trans. Edinb. Geol. Soc.*)

ROYAL PHYSICAL SOCIETY OF EDINBURGH:
Proceedings. (*Proc. R. Phys. Soc. Edinb.*)

GEOLOGICAL SOCIETY OF GLASGOW:
Proceedings. (*Proc. Geol. Soc. Glasgow.*)

NATURAL HISTORY SOCIETY OF GLASGOW:
Proceedings. (*Proc. Nat. Hist. Soc. Glasgow.*)

ROYAL DUBLIN SOCIETY:
*Proceedings.** (*Proc. R.D.S.*)

WATERFORD AND SOUTH-EAST OF IRELAND ARCHÆOLOGICAL SOCIETY:
Journal. (*Journ. Waterford & S.E. Ireland Arch. Soc.*)

MUSÉUM D'HISTOIRE NATURELLE (Paris):
Annales.

SOCIÉTÉ DE SPÉLÉOLOGIE (Paris):
Spelunga: Bulletin.

JOURNALS, &c.—

Academy.
Annales des Sciences Naturelles.
Annals and Magazine of Natural History. (*Ann. & Mag. Nat. Hist.*)
Annals of Philosophy.
Archæologia.
Archæological Journal.
Dublin Evening Telegraph.
Dublin Penny Journal.
Edinburgh Journal of Science.
Edinburgh New Philosophical Magazine. (*Edinb. New Phil. Mag.*)
Farmers' Gazette.
Irish Penny Magazine.
Magazine of Natural History (*Mag. of Nat. Hist.*)

* Not to be confounded with the *Scientific Proceedings* issued by this Society.

Natural Science.
Nature.
Philosophical Magazine. (*Phil. Mag.*)
Popular Science Review.
Science Gossip.
Zoologist. (*Zool.*)

It only remains to add a few particulars concerning the list which follows.

Brackets are used to show all editorial additions—the subject of papers which have no printed title, the names of authors of papers published anonymously, and all editorial comments, &c.

When the title of a paper does not sufficiently express its scope, a brief note of its contents is added.

A book or paper is not included in the list if it merely quotes from another without any original expression of opinion—such, for instance, are the references to Irish glacial geology in certain general text-books of geology.

Announcements of exhibits or donations, accounts of excursions, or other officially supplied items in the Proceedings of Societies, are entered under the name of the Society publishing them.

When the date of the reading of a paper before a Society differs from its date of publication, the former is usually given in brackets in addition to the latter. The Volumes of Proceedings of Societies are usually published in parts, and the publication of a volume frequently extends over several years. In bound volumes there is frequently no means of discovering the date of publication of any particular paper, owing to the destruction of the covers or temporary title-pages of the parts. In such cases the date given without brackets is the date on the title-page of the volume; the *collective* date of the volume being usually added in brackets immediately after the number of the volume.

In addition to the contracted titles already given, the following contractions are used:—descr.=description; ref.=reference; locs.=localities; glac.=glacial; post-glac.=post-glacial; geol.=geology.

The list includes papers published up till the end of the year 1895.

LIST OF PAPERS, &c.

1 **A. (M.).**

Islands of Oyster Shells. *Journ. Cork Hist. & Arch. Soc.*, II., 39. 1893. [Near Fota, Co. Cork.]

2 **Adams (A. Leith).**

Report on the Exploration of the Shandon Cave. *Trans. R.I.A.*, XXVI., 187—230, plate 3. 1876. [Full descr. of deposits and animal remains.]

3 —

Observations on the Remains of Mammals found in a Fossil State in Ireland. *Journ. R.G.S.I.*, IV., 246—248. 1877.

4 —

Monograph of the British Fossil Elephants. *Palæontographical Soc.*, 1877-81. [Irish localities.]

5 —

On the Recent and Extinct Irish Mammals. *Sci. Proc. R.D.S.*, n.s. II., 45—86, plates 1—5. (read 1878). 1880.

6 —

Report on the History of Irish Fossil Mammals. *Proc. R.I.A.*, (2) III. (*Science*), 89—100. 1878. ["Abridgement of the Report."]

—

See **Ussher (678, 679, 680).**

7 **Adams (A. Leith) S. Haughton, W. Boyd Dawkins,** and **John Evans.**

First Report of the Committee appointed for the Purpose of exploring the Caves of the South of Ireland. *Brit. Assoc. Report for* 1880, 209—211. 1880. [Consists of a report from R. J. Ussher and a letter from R. Day on Carrigower.]

8 — — — —

Second Report do. do. do. *Brit. Assoc. Report for* 1881, 218—221. 1882. [Report from R. J. Ussher.]

9 **Adams (A. Leith), G. H. Kinahan,** and **R. J. Ussher.**

Explorations in the Bone Cave of Ballynamintra, near Cappagh, County Waterford. *Sci. Trans. R.D.S.*, n.s. I., 177—266, plates 11—14. 1881. [Full descr. of deposits and fossils.]

10 **Agassiz (Louis).**

On Glaciers, and the evidence of their having once existed in Scotland, Ireland, and England. *Proc. Geol. Soc. Lond.*, III. *ii.*, 327—332. 1840-41. [Brief ref. to Irish striated rocks].

11 —

The Glacial Theory and its recent Progress. *Edinb. New Phil. Journ.*, XXXIII., 217—283. 1842. [Brief ref. to Irish erratics, p. 223.]

12 **Ainsworth (W.).**

An Account of the Caves of Ballybunian, Co. Kerry, with some mineralogical Details. 96 pp. 8vo. Dublin, 1834. [Descr.]

13 Allman (G. J.).
Notice of erratic blocks of greenstone, occurring in the neighbourhood of Bandon, County Cork. (Abstract.) *Journ. G.S.D*, III., 242. 1847.

14 Andrews (Mary K.).
Denudation at Cultra, Co. Down. *I.N.*, II., 16—18, 47—49, plate. 1893; and *Proc. B.N.F.C.*, (2) III., 529—532, plate (for 1892-93), 1893. [Post-glac. denudation.]

15 Andrews (Thomas).
On some Caves in the Island of Rathlin and the adjoining Coast of the County of Antrim. *Brit. Assoc. Report for* 1834, 660. 1835. [Short abstract: general descr.]

16 —
On the Composition of an Inflammable Gas Issuing from below the Silt-Bed of Belfast. *Proc. B.N.H. & P.S. for* 1873-74, 93—94. 1874.

17 Andrews (W.).
On Oyster Deposits. *Journ. R.G.S.I.*, II., 13—15. (read 1867). 1871. [Those of Kenmare river are quite recent.] [For discussion on this paper see same vol., p. 132.]

Anon.
A Philosphical Survey of the South of Ireland . . . (1788), see **Campbell (755).**

—
A Tour through Ireland . . . . (1780), see **Luckombe (760).**

—
Excursions through Ireland [1818], see **Cromwell (754).**

18 —
Fossil Deer of Ireland. *Dublin Phil. Journ. & Scient. Review*, I., 478—486. 1825; reprinted in *Annals of Philosophy*, n.s. XI., 305—312. 1826. [Edit. notes, and extracts from Maunsell (**503**) and Hart (**266**).]

19 —
Kingston Cave. *Dublin Penny Journ.*, II., No. *61*, 65—66. Aug. 31, 1833. [Discovery and descr. of Mitchelstown cave.]

20 —
Stalactite Cavern at Mitchelstown. *Dublin Penny Journ.*, III., No. *130*, 201—208, maps. Dec. 27, 1834. [Ed. note: letter from Dr. Nichol: anon. letter: paper by Dr. Apjohn, reprinted (**28**).]

21 —
Remarkable Discovery of Fossil Remains. *Farmer's Gazette*, V., 487, Nov. 28, 1846. Reprinted in *Zool.*, V., 1593—1595, 1847, under the title "Discovery of the Bones of Deer and Cattle at Lough Gur." [Descr. of Lough Gur find by an eye-witness.]

22 —
Ancient Lake-habitations of Switzerland and Ireland. *Ulst. Journ. Arch.*, VII., 179—194. 1859. [Descr. of several Irish crannogs.]

23 Anon.

Human Remains. *Geologist* for 1862, 353. [Human body in gravel below 11 feet of bog, Earl of Moira's estate, Co. Down].

24 —

[Skeleton and horns of Irish deer in "soil" at bottom of pond, Fethard, Co. Tipperary]. *Dublin Evng. Telegraph*, Nov. 6, 1884.

25 —

Finds of Elkheads, &c. [Note.] *Proc. & Papers R.S.A.I.*, (5) I., (1890-91), 485. 1892. [At Cappagh Bog, Adare, Co. Limerick.]

26 —

General Guide to the Science and Art Museum, Dublin. 8vo. Dublin, 1892. [Preface by V. Ball.] [List with locs. of Fossil Mammals of Ireland, pp. 23—25.]

27 Antisell (T.).

Irish Geology, in a series of chapters, containing an outline of the science of Geology, and a description of the various rocks distributed on the surface of the Island, with some remarks on the climate. 84 pp. 12mo. Dublin, 1846. [Chap XI., Tertiary system.]

28 Apjohn (J.).

On the newly discovered Cave situate between Cahir and Mitchelstown. *Journ. G.S.D.*, I. (1833—38), 103—111 (read 1834), 1838; reprinted with illustr. in *Dublin Penny Journ.*, III. No. *130*, Dec. 27, 1834 (see **20.**)

29 Archer (F.).

Notes on the Worked Flints of the Raised Beaches of the N.E. Coast of Ireland. *Proc. L'pool Geol. Soc.*, IV. *iii.* (1880-81), 209—216. 1881. [Good descr., Larne, Kilroot, &c.]

30 Atkinson (George M.).

Kitchen Middens in the Estuary of Cork Harbour. *Journ. R.H. & A.A.I.*, (4) II. *ii.* (1873), 258—261, plate. 1874. [Descr., lists of shells, &c.]

31 Baily (William Hellier).

Sketch of the Geology of Belfast and the Neighbourhood. *Hardwicke's Science Gossip for* 1874, 169—170. 1874. [Ref. to post-glac. deposits.]

32 —

Sketch of the Geology of Dublin and Wicklow. *Hardwicke's Science Gossip for* 1878, 179—183. 1874. [Short descr., glac. & post-glac. beds.]

33 —

Palæontology of County Dublin; [being pp. 48—72 of *Guide to the County of Dublin.*] 8vo. 1878. Also published in *Sci. Proc. R.D.S.*, n.s. I., 162—182, 1878, and in *Journ. R.G.S.I.*, V., 78—98. 1880. [Lists of glacial fossils from Killiney, Howth, and high-level gravels.]

34 —

Rambles on the Irish Coast. 8vo. Dublin, 1886. [Drift deposits, pp. 40—42.]

35 Ball (John).
Notice of the former existence of small glaciers in the County of Kerry. *Journ. G.S.D.*, IV., 151—154. 1849.

36 Ball (Robert).
On the Remains of Oxen found in the Bogs of Ireland. *Proc. R.I.A.*, I., 253—254. 1832. [Characters and distribution.]

37 —
On the Bones of Oxen found in the Bogs of Ireland. (Abstract.) *Journ. G.S.D.*, III., 50—51. 1844. [*Bos longifrons.*]

38 —
On the Skulls of Bears found in Ireland. *Proc. R.I.A.*, IV., 416—420 (read 1849). 1847-50. Reprinted in *Ann. & Mag. Nat. Hist.*, (2) V., 234—236. 1850. [Two skulls of *U. arctos* from Westmeath. Letter from R. Owen.]

39 Ball (Valentine).
On the Collection of the Fossil Mammalia of Ireland in the Science and Art Museum, Dublin. *Sci. Trans. R.D.S.*, (2) III., 333—350, plate 11. 1885. [Full catalogue; bibliography.]

40 —
On Bones and Antlers of *Cervus giganteus* incised and marked by Mutual Attrition while buried in Bogs or Marl. *Brit. Assoc. Report for* 1893, 756. 1894. [Longford and Limerick.]

—
See General Guide to S. & A. Museum (**27**).

41 Barker (John).
[Discusssion on indented bones of *Megaceros.*] *Journ. G.S.D.*, X. (1862-64), 169. 1864.

42 Bannon (Bernard).
[Exhibited wrought stake found 25 feet below bog, Co. Fermanagh.] *Journ R.H. & A.A.I.*, V. *iii.* (for 1881), 500—501. 1882.

43 Belfast Natural History and Philosophical Society.
[Presentation of *Megaceros* bones from branch dock, Belfast, by R. Lloyd Praeger.] *Proc. for* 1891-92, 11. 1893.

44 —
[Presentation of bones and shells from Rosapenna Kitchen-middens by W. H. Patterson; *Megaceros* bones from Belfast by R. M. Young; other bones from same place by S. F. Milligan.] *Proc. for* 1893-94, 9. 1894.

45 Belfast Naturalists' Field Club.
Guide to Belfast and the adjacent Counties. 8vo. Belfast, 1874. [Genl. descr. of glac. and post-glac. deposits of Down and Antrim, pp. 68—77.]

—
Systematic Lists illustrative of the Flora, Fauna, Palæontology, and Archæology of the North of Ireland. By Members of the Belfast Naturalists' Field Club. 8vo. Vol. 1. (1870-1886). 1886. See **Stewart (636,637), Wright (734).**

46 **Belfast Naturalists' Field Club.**
[Excursion to Kilroot]. *4th Ann. Report* (for 1866-67), 6. 1867. [Flint-flakes from near Carrickfergus.]

47 —
[Ref. to Woodburn boulder clay and fossils.] *4th Ann. Report* (for 1866-67), 16. 1867.

48 —
Excursion to Castle Espie. *5th Ann. Report* (for 1867-68), 15–16. 1868. [Ref. to glac. beds and flint-flakes.]

49 —
Excursion to Toome. *5th Ann. Report* (for 1867-68), 7—8. 1868. [Ref. to occurrence of flint-flakes.]

50 —
[Ref. to submerged peat and raised beach, Portrush.] *6th Ann. Report* (for 1868-69), 10. 1869.

51 —
Excursion to Gobbins. *6th Ann. Report* (for 1868-69), 13. 1869. [Ref. to glac. beds.]

52 —
Excursion to Larne. *7th Ann. Report* (for 1869-70), 23. 1870. [Curran gravels and implements.]

53 —
Excursion to Ballintoy. *8th Ann. Report* (for 1870-71), 16. 1871. [Flint-flakes, &c.]

54 —
Excursion to Broughshane, &c. *9th Ann. Report* (for 1871-72), 15. 1872. [Flint-flakes, &c., at Ticloy.]

55 —
Excursion to Enniskillen, &c. *10th Ann. Report* (for 1872-73), 23. 1873. [Caves near Marble Arch.]

56 —
[Ref. to Ballyruther gravels and mammoth remains.] *Proc.*, (2) I., 166—167 (for 1875-76). 1876.

57 —
Excursion to Killyleagh, &c. *Proc.*, (2) I., 245 (for 1876-77). 1878. [Glac. beds of Strangford Lough.]

58 —
Excursion to Greenore. *Proc.*, (2) I., 332 (for 1878-79). 1879. [Raised beach, implements, striæ.]

59 —
Excursion to Toome. *Proc.*, (2) I., 401—402 (for 1879-80). 1881. [Diatomaceous earth, implements.]

60 —
Excursion to Dromore. *Proc.*, (2) II., 9 (for 1880-81). 1882. [Irish elk.]

61 **Belfast Naturalists' Field Club.**
Excursion to Cultra. *Proc.*, (2) II., 13 (for 1880-81). 1882.
[Flint implements.]

62 —
Excursion to Woodburn. *Proc.*, (2) II., 94—95 (for 1881-82). 1883.
[Boulder clay.]

63 —
Excursion to Ballycastle. *Proc.*, (2) II., 102—104 (for 1881-2). 1883.
[Ice-action at Fairhead. Sandhill sites at White Park Bay.]

64 —
Excursion to Larne. *Proc.*, (2) II., 107—108 (for 1881-2). 1883.
[Raised beach, estuarine clay, implements.]

65 —
Excursion to Cultra. *Proc.*, (2) II., 225—226 (for 1883-84). 1884.
[Boulder clay with erratics. Implements.]

66 —
Excursion to Ram's Island. *Proc.*, (2) II., 229 (for 1883-84). 1884.
[Boulder clay with erratics.]

67 —
Excursion to Toome. *Proc.*, (2) II., 416 (for 1885-86). 1886.
[Boulder clay, marl, peat.]

68 —
Excursion to Mourne Mountains. *Proc.*, (2) II., 420 (for 1885-86). 1886. [Glaciation of the range.]

69 —
Excursion to Greyabbey. *Proc.*, (2) II., 428 (for 1885-86). 1886.
[Butterlump stone, a large erratic.]

70 —
Excursion to Knockagh. *Proc.*, (2) II., 508 (for 1886-87). 1887.
[Sea-caves at 600 feet].

71 —
Excursion to Portaferry, &c. *Proc.*, (2) III., 18 (for 1887-88). 1888.
[Raised beach, Ballyquintin.]

72 —
[Ref. to Stoneyford boulder clay.] *Proc.*, (2) III., 91 (for 1888-89). 1889.

73 —
Excursion to Scrabo. *Proc.*, (2) III., 169—170 (for 1889-90). 1890.
[Boulder clay.]

74 —
Excursion to Mourne Mountains. *Proc.*, (2) III., 181 (for 1889-90). 1890. [Ice-moulding on Moolieve.]

75 —
Excursion to Kilroot. *Proc.*, (2) III., 257—261 (for 1890-91). 1891.
[Raised beaches, Kilroot and Whitehead.]

76 **Belfast Naturalists' Field Club.**
Excursion to Magheramorne. *Proc.*, (2) III., 265 (for 1890-91). 1891. [Boulder clay overlying gravel in quarry.]

77 —
Excursion to Glenarm. *Proc.*, (2) III., 276 (for 1890-91). 1891. [Ballyrudder glacial gravels.]

78 —
Excursion to Killyleagh. *Proc.*, (2) III., 354 (for 1891-92). 1892. [Boulder clay on Dunnyneile Island.]

79 —
Excursion to Enniskillen, &c. *Proc.*, (2) III., 362 (for 1891-92). 1892. [Cave near Marble Arch.]

80 —
Excursion to Whitepark. *Proc.*, (2) III., 466 (for 1892-93). 1893. [Sand-hill settlements.]

81 —
Excursion to Killough &c. *Proc.*, (2) III., 494 (for 1892-93). 1893. [Glacial section north side Killough Bay.]

82 —
Excursion to Portaferry, &c. *Proc.*, (2) IV., 21 (for 1893-94). 1894. [Glaciation at Ballyquintin.]

83 —
Excursion to Dundrum, &c. *Proc.*, (2) IV., 183 (for 1894-95). 1895. [Raised beach of Newcastle sand-hills.]

84 —
Excursion to Templepatrick (Geol. Section). *I.N.*, IV., 343. 1895. [Boulder clay, erratic.]

—
See **Kendall (368).**

85 **Bell (Alfred).**
The Palæontology of the Post-glacial Drifts of Ireland. *Geol. Mag.*, X., 447-453. 1873. [General descr. and lists of fossils.]

86 —
Irish Drifts. *Geol. Mag.*, (2) X., 336. 1883. [Portlock's glacial fossils—reply to Swanston.]

87 —
First Report of the Committee . . . upon the "Manure" Gravels of Wexford. *Brit. Assoc. Report for* 1887, 209—211. 1888. [General descr.]

88 —
Second Report do. do. do. *Brit. Assoc. Report for* 1888, 133—141. 1889. [Wexford, Killiney, Bray; details, fossils.]

89 —
Third Report do. do. do. *Brit. Assoc. Report for* 1889, 92—93. 1890 [General conclusions.]

90 Bell (Alfred).
Fourth and Final Report do. do. do. *Brit. Assoc. Report for* 1890, 410—424. 1891. [General descr. and fossil lists, Pliocene, glac., and post-glac. beds, Wexford to Portrush.]

91 —
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94 Benn (Edward).
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[Remarks on Bears' bones.] *Journ. G.S.D.*, X. (1862-64), 174. 1864. [From Co. Limerick.]

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A Natural History of Ireland in three parts. 4to. Dublin, 1755. [Letter of Francis Nevil to the Bishop of Clogher on the Maghery find of elephant's teeth (**522**), and Dr. Molyneux's remarks thereon (**509**), with plate, (reprinted from *Phil. Trans.* XXIX.). Discourse concerning the large Horns frequently found under ground in Ireland . . . by Thomas Molyneux (**508**), with plate, (reprinted from *Phil. Trans.* XIX.).]

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The Antiquities of Cloyne. *Journ. Kilk. Arch. Soc.*, II. (1858-59), 253—266. 1859. [Descr. of caves, p. 258.]

106 Brenan (Edward).

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107 Brownrigg (W. B.) and Theodore Cooke.

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112 Buick (Rev. George Raphael).

On Flint workshop sites at Glenhue, County Antrim. *Journ. R.H. & A.A.I.*, (4) VI. *i.* (1883), 120—126. 1884. [Surface finds.]

113 Buick (Rev. **George Raphael**).
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114 —
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[Memorandum on crannog finds]. *Proc. R.I.A.*, V. (1850-53). 214—215 (read 1851). 1853.

117 Busk (**George**).
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C. (**J.**) see **Coleman** (**140,141**).

118 Campbell (**J. F.**).
On the Glaciation of Ireland. *Q.J.G.S.*, XXIX., 198—225. 1873. Abstract in *Geol. Mag.*, X., 127. 1873. [Full paper: general glaciation, &c.]

Campbell (**Thomas**) see **754**.

119 Cane (**Robert**).
The Gigantic Irish Fossil Deer. *Journ. Kilk. Arch. Soc.*, I., 164—166. 1850.

Carpenter (**G. H.**) see **755**.

120 Carte (**Alexander**).
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121 —
[Remarks on deer remains]. *Journ.G.S.D.*, X. (1862-64), 166 (read 1863). 1864. [From Cos. Limerick and Dublin.]

122 —
On the Remains of the Reindeer which have been found fossil in Ireland. *Journ. G.S.D.*, X. (1862-64), 103—107 (read 1863). 1864; and *Dublin Q.J.S.*, IV., 103—107, plate 3. 1864.

123 —
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Notice of discovery of American Reindeer at Ashbourne, Co. Dublin. *Journ. G.S.D.*, X. (1862-64), 71 (read 1862). 1864.

125 Carte (Alexander).

On some indented Bones of the Cervus Megaceros, found near Lough Gur, County of Limerick. *Journ. R.G.S.I.*, I., 151—154, plate 7 (read 1866). 1867. [For discussion see pp. 177—179]; and *Dublin Q.J.S.*, VI., 308—312, plate 5. 1866. [Indentations produced by rubbing when *in situ*.]

126 Charnock (R. S.).

[Presented and described a greenstone celt from Toome, found with many implements and a canoe, 10—12 feet below bed of Lough Neagh.] *Proc. Soc. Ant. London for* 1861-64, (2) *ii.*, 119.

127 Clarke (Dr. —).

On certain Alterations of Level on the Sea Coast of part of the County of Waterford, and the cause thereof. *Brit. Assoc. Report for* 1857, *Sections*, 65. 1858. [Raised beach up to 60 feet.]

128 Close (Rev. **Maxwell H.**).

Notes on the General Glaciation of the Rocks in the Neighbourhood of Dublin. *Journ. R.G.S.I.*, I., 3—13, plate 1 (read 1864). 1867. [For discussion see pp. 91—93]; and *Dublin Q.J.S.*, V., 177—187, plate 5. 1865. [Important paper.]

129 —

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130 —

On the General Glaciation of Ireland [a letter]. *Geol. Mag.*, IV., 234—235, plate 1. 1867. [Explanation of map showing striæ over all Ireland.]

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134 Cody (Patrick).

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135 Colby (Lt.-Col. **Thomas**).

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136 Cole (Grenville Arthur James).
County Dublin, Past and Present. V., From Past to Present. *I.N.*, I., 90—95. 1892. [General descr. of glac. geology.]

137 —
[Exhib. Ailsa Craig rock, from Killiney and Greystones.] Dublin Micro. Club, in *I.N.*, II., 172. 1893.

138 —
Glacial Drift of the Irish Channel. *Nature*, XLVII., 464. 1893. [Ailsa Craig rock at Killiney and Greenore.]

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140 C[oleman] (J[ames]).
Cork County and the Ice Age. *Journ. Cork Hist. & Arch. Soc.*, I., 192. 1892. [Glaciation.]

141 —
Islands of Oyster Shells. [note]. *Journ. Cork Hist. & Arch. Soc.*, II., 59. 1893. [Kitchen-middens in Cork Harbour.]

142 Coleman (James).
Additional Irish Caves. *I.N.*, IV., 94. 1895. [In Cork and Kerry.]

143 Commissioners appointed to inquire into the nature and extent of the several **Bogs in Ireland,** and the practicability of draining and cultivating them: 1st, 2nd, 3rd, and 4th Reports. Folio. 1810-14. [Many maps and sections.]

144 Conwell (Eugene A.).
On a Fossil Mussel-shell found in Drift in Ireland. *Brit. Assoc. Report for* 1869, *Sections*, 87. 1870. [A fresh shell from base of an esker near Trim.]

Cooke (Theodore), see **Brownrigg (107).**

145 Cork Naturalists' Field Club.
[Excursion to "The Ovens" cave.] *I.N.*, III., 241. 1894.

146 Cox (Robert).
Megaceros Hibernicus [a letter]. *Geol. Mag.*, VI., 523. 1869. [Skull and antlers from bog at Schiule, Co. Limerick.]

147 Croker (Thomas Crofton).
Researches in the South of Ireland. 4to. London, 1824. [Caves at Cloyne: cave at Castlemartyr with skeleton covered with gold plates, pp. 251—253.]

Cromwell (T. K.), see **757.**

Crosskey (Henry William), see **Brady,** &c. **(104).**

148 Cruise (Richard J.).
Explantatory Memoir to accompany sheets 89 and 90 of the Maps of the Geological Survey of Ireland, illustrating parts of the counties of Longford, Westmeath, and Meath. 8vo. 1872. [Glac. & post-glac. 24—26.]

149 Cruise (Richard J).

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152 Cusack (M. F.).

A History of the County and City of Cork. 8vo. Dublin and Cork, 1875. Pp. 419—453: The Geology of Co. Cork, contributed by Rev. M. H. Close. [Glac. & post-glac. geology, caves, &c.]

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Cave Hunting. 8vo. London, 1874. [Short ref. to Shandon cave, &c. 335.]

156 —

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The British Pleistocene Mammalia. Part A: A Preliminary Treatise on the Relation of the Pleistocene Mammalia to those now living in Europe. *Palæontographical Soc.*, XXXII. 1878. [Brief ref. to Ireland.]

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[Flint Implements from Toome, Co. Antrim.] *Journ. Kilk. Arch. Soc.*, V. *ii.*, 226—228. 1865.

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[Communication on presenting flint-flakes from near Belfast.] *Journ. R.H. & A.A.I.*, (3) I. (1868-69), 147—148. 1873.

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[Extracts from his Journal.] *Journ. Kilk. Arch. Soc.*, V. *iii.*, 441. 1866. [Irish elk finds.]

163 Denny (Henry).
On the Claims of the Gigantic Irish Deer to be considered as contemporary with Man. *Proc. Geol. & Polytechnic Soc. of W. Riding of Yorks.*, III. (1845-59), 400—440 (read 1855). 1859. [Full paper.]

164 —
Observations on the Distribution of the extinct Bears of Britain, with especial reference to a supposed new Species of Fossil Bear from Ireland. *Proc. Geol. & Polytechnic Soc. of W. Riding of Yorks.*, IV. (1859-68), 338—358, plate 10 (read 1864). 1869. [Brenan's Shandon specimens.]

165 Dickie (George).
[On "a recent deposit of wood, shells, &c.," at Newcastle, Co. Down.] Read before B.N.H. & P.S., 24 Febr., 1858. [For contents see Praeger, **581**, p. 240. At this time the Proceedings of this Society were issued at intervals in leaflet form, without consecutive paging, &c.]

166 Dickson (John Mitchell).
Crannog-hunting in Co. Down. *Ulst. Journ. Arch.*, n.s. I., 290. 1895. [Localities.]

167 Dixon (Robert V.).
On the Occurrence of an Ancient Paved Road, under deep bog, in the neighbourhood of Omagh, County of Tyrone [a letter]. *Journ. G.S.D.*, IX., 343—344 (read 1861). 1862.

168 Donovan (—).
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169 Drummond (James L.).
On Fossil Infusoria found in the County Down, Ireland. *Magazine of Nat. Hist.*, n.s. III., 353—355. 1839. [At Lough Island Reavy: descr. of deposit, &c.]

170 Dunne (Right Hon. Major-Gen. **F. P.**).
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171 Du Noyer (George Victor).

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173 —

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174 —

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175 —

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176 —

Drift at Donald's Hill, Ireland. *Geologist for* 1861, 116—117. 1861. [Co. Derry: deers' horns, &c., under drift on denuded surface of Chalk.]

177 —

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180 —

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181 —

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182 —

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183 Du Noyer (George Victor).

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See **Jukes (334 to 345, 351), O'Kelly (533).**

184 Du Noyer (George Victor) and J. Beete Jukes.

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185 Edgeworth (Richard Lovell).

A further Account of Discoveries in the Turf Bogs of Ireland. *Archæologia*, VII., 111—112 (read 1783). 1785. [Iron, wooden, and textile articles under 15 feet of bog near Mullingar.]

186 Egan (F. W.).

Explanatory Memoir to accompany sheet 48 of the maps of the Geological Survey of Ireland, illustrating parts of the counties of Down and Armagh. 8vo. 1872. [Glac. & post-glac. 38—42. Deer remains.]

187 —

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188 —

Do. do. sheet 59 do. do., including the districts of Newtownhamilton, Keady, and Castleblayney. 8vo. 1877. [Phys. geogr. 7—9; glac. & post-glac. 24—25; striæ 30—31.]

189 —

Do. do. sheet 27 do. do., including . . . [parts of] Londonderry . . . Tyrone, and . . . Antrim. 8vo. 1881. [Phys. geogr. 7—9; glac. & post-glac. 35—40; striæ 43—44.]

190 —

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191 —

Do. do. sheet 13 do. do. 8vo. 1884. [Cos. Derry & Antrim. Phys. geogr. 5—7; glac. and post-glac. 11—14.]

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See **Hull (307), Kinahan (433), Nolan (528, 529), Symes (649), Traill (667), Wilkinson (718).**

192 Egan (F. W.), J. R. Kilroe, and W. F. Mitchell.

Explanatory Memoir to accompany sheet 24 of the maps of the Geological Survey of Ireland, comprising portions of the counties of Donegal and Tyrone. 8vo. 1888. [Phys. geogr. 7—12; glac. and post-glac. 38—45.]

193 Enniskillen (Earl of).

[Remarks on crannogs.] *Proc. R.I.A.*, V. (1850-53), 214—215 (read 1851). 1853.

194 Evans (John).

On some Discoveries of Stone Implements in Lough Neagh, Ireland. *Archæologia*, XLI., 397—408, plate 18. 1867-68. [At Lurgan and Toome.]

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Address, Section C. *Brit. Assoc. Report for* 1878, 519—527. 1879. [Ref. to absence of palæolithic implements, &c.]

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See **Adams (7, 8).**

196 F. (J.).

Ancient Iron Fetters. *Ulst. Journ. Arch.*, VI., 168—169. 1858. [Stone crannog submerged in Port Lough near Londonderry.]

197 Firth (William A.) and William Swanston.

References to the Diatomaceous Deposits at Lough Mourne, and in the Mourne Mountains. *Proc. B.N.F.C.*, (2) III., 62—64 (for 1887—88). 1888. [Descr. and lists of species.]

198 Foot (Arthur Wynne).

An Account of a Visit to the Cave of Dunmore, with some remarks on Human Remains found therein. *Journ. R.H. & A.A.I.*, (4) I. *i.*, 65-94. 1870. [Full descr., and lists of human bones]

199 Foot (Frederick J.)

Description of Ballyallia Cave, near Ennis, with Account of the Discovery there of the Lesser Horse-Shoe Bat. *Proc. Dublin Nat. Hist. Soc.*, II. (1856-59), 152—154 (read 1859). 1860; and *Nat. Hist. Review*, VI., 379—381. 1859.

200 —

Explanations to accompany sheet 136 of the Maps of the Geological Survey of Ireland, illustrating parts of the Queen's County, and of the counties of Kilkenny and Tipperary. 8vo. 1860. [Glac. & post-glac. 14.]

201 —

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202 —

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203 —

Glacial striæ in the County of Longford [a letter]. *Geol. Mag.*, II., 524—525. 1865.

204 —

On a Recent Erratic Block. *Journ. R.G.S.I.*, I. (1864-67), 32—34 (read 1864).1867; and *Dublin Q.J.S.*, V., 192—194. 1865. [A 2-ton block moved 50 yards by ice, L. Ree, Co. Longford.]

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See **Foot (758), Jukes (346, 347), Kinahan (425, 426).**

205 [**Foot (Frederick J.)**, and **J. Beete Jukes.**]
Explanations to accompany sheets 131 and 132 of the maps of the Geological Survey of Ireland, illustrating part of the County of Clare. 8vo. 1860. [Glac. & post-glac. 20—21. Marl shells.]

206 [**Foot (Frederick J.)** and **George Henry Kinahan**].
Do. do. sheet 133 do. do. illustrating a portion of the County of Clare. 8vo. 1862. [Glac. & post-glac. 32—34. *Megaceros.*]

207 [**Foot (Frederick J.)**, **J. Beete Jukes**, and **Richard Glascott Symes.**]
Do. do. sheets 96, 97, 106, and 107 do. do., illustrating parts of the counties of Galway and Roscommon. 8vo. 1867. [Glac. & post-glac. (eskers chiefly) 23—38; marl shells.]

208 **Foot (Frederick J.)** and **J. O'Kelly.**
Do. do. sheets 98, 99, 108, and 109 do. do., illustrating parts of the Counties of Westmeath, Roscommon, Galway, Longford, and King's County. 8vo. 1865. [Glac. & post-glac. (eskers chiefly) 20—35.]

209 [**Foot (Frederick J.)**, **J. O'Kelly**, and **J. Beete Jukes.**]
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210 **Forbes (Edward).**
On the Connection between the existing Fauna and Flora of the British Isles, and the Geological changes which must have effected their Area, especially during the Epoch of the Northern Drift. *Memoirs of the Geol. Survey of Gt. Britain*, I., 336—432. 1846. [General considerations and descr.; table of fossils, Slade and Featherd, Co. Wexford, and Tramore, Co. Waterford; genl. list of glac. fossils.]

211 **Frazer (William).**
Remarks on specimens of Fungi, obtained adhering to old trees under a bog near Tralee. *Proc. Dublin Nat. Hist. Soc.*, II. (1856-59), 34—35 (read 1857). 1860; and *Nat. Hist. Review*, IV., 87—88. 1858. [*Polypori* under 13 feet of bog.]

212 —
On a Dish of Wood found in a Bog at Ballymoney. *Proc. & Papers R. S.A.I.*, (5) I. (1890-91), 586—587. 1892. [Below 16 feet of bog, Co. Antrim.]

213 **Geikie (James).**
On Changes of Climate during the Glacial Epoch: 4th Paper. *Geol. Mag.*, IX., 105—111. 1872. [General view of the Irish series.]

214 —
The Great Ice Age and its Relation to the Antiquity of Man. 8vo. 1874. (and subsequent editions). [Refs. to Irish deposits.]

215 **Geinitz (H. B.).**
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337 [— —]

Do. do. sheets 102 and 112 do. do., illustrating parts of the Counties of Dublin and Meath. 8vo. 1861. [Glac. 50; sections 62; glac. & post-glac. 66—68.]

338 [— —]

Do. do. sheet 175 do. do. . . . illustrating part of the county of Cork. 8vo. 1861. [Glac. 29—30.]

339 [— —]

Do. do. sheet 173 do. do., illustrating part of the County of Kerry. 8vo. 1861. [Glac. 23—24.]

340 [— —]

Do. do. sheets 194, 201, 202 do. do., illustrating a part of the County of Cork. 8vo. 1862. [Glac. & post-glac. 27.]

341 — —

Explanation of sheets 160, 161, 171, and part of 172, and of the engraved section, sheet No. 15 of the Geological Survey of Ireland, illustrating part of the County of Kerry. 8vo. 1863. [Glac. & post-glac. 48—49.]

342 — —

Explanations to accompany sheets 121 and 130 of the maps of the Geological Survey of Ireland, illustrating a portion of the counties of Wicklow and Dublin. 8vo. 1869. [Glac. 11; glac. & post-glac. 45—47.]

343 [Jukes (Joseph Beete), G. V. Du Noyer, J. O'Kelly, and A. B. Wynne].

Data and Descriptions to accompany Quarter Sheet 35 N.E., [sheet 119] of the maps of the Geological survey of Ireland. 8vo. 1858. [Kildare, King's and Queen's cos. Glac. & post-glac. 17—18.]

344 [**Jukes (Joseph Beete), G. V. Du Noyer,** and **A. B. Wynne.**]
Do. do. Quarter Sheet 45 S.W. [sheet 165], do. do. 8vo. 1858. [Limerick, Cork, Tipperary. Glac. 23.]

345 [— — —]
Do. do. Quarter Sheet 45 S.E. [sheet 166], do. do. 8vo. 1858. [Tipperary, Waterford. Cave 4; glac. and post-glac. 22—23, 27.]

346 [**Jukes (Joseph Beete)** and **Frederick J. Foot.**]
Explanations to accompany sheet 162 of the maps of the Geological Survey of Ireland, illustrating part of the County of Kerry. 8vo. 1859. [Glac. 16.]

347 [— —]
Do. do. sheets 150 and 151 do. do., illustrating part of the County of Kerry. 8vo. 1859. [Glac. and post-glac. 16.]

348 [**Jukes (Joseph Beete)** and **G. H. Kinahan.**]
Do. do. sheet 128 (formerly quarter sheet 35 S.E.) do. do., illustrating parts of the County of Kildare and Queen's County. 8vo. 1859. [Glac. and post-glac. 13, 28—30.]

349 [— —]
Do. do. sheets 163, 174 and part of 175 do. do., illustrating parts of the Counties of Limerick, Kerry, and Cork. 8vo 1861. [Glac. & post-glac. 31.]

350 [— —]
Do. do. sheets 200, 203, 204, and 205, and part of 199 do. do., illustrating part of the County of Cork. 8vo. 1861. [Glac., Chalk flints 17; glac. & post-glac. 19—20.]

351 [**Jukes (Joseph Beete,) G. H. Kinahan,** and **G. V. Du Noyer.**]
Do. do. sheet 137 (formerly quarter sheet 40 N.E.) do. do. 8vo. 1859. [Kilkenny, Carlow, Queen's Co., Kildare. Denudation 5—8; sections 25—48; glac. and post-glac. 49—51.]

352 [**Jukes (Joseph Beete), G. H. Kinahan,** and **J. O'Kelly.**]
Do. do. sheets 197 and 198, and the south-east part of 191 do. do., illustrating part of the Counties of Cork and Kerry. 8vo. 1860. [Glac. & post-glac. 28—29.]

353 [**Jukes (Joseph Beete), G. H. Kinahan,** and **A. B. Wynne.**]
Do. do. sheet 144 do. do., illustrating parts of the Counties of Limerick, Tipperary, and Clare. 8vo. 1860. [Glac. & post-glac. 34—36: *Megaceros.*]

354 [**Jukes (Joseph Beete),** and **J. O'Kelly.**]
Do. do. sheet 154 do. do., illustrating part of the Counties of Limerick and Tipperary. 8vo. 1861. [Glac. & post-glac. 27.]

355 [**Jukes (Joseph Beete),** and **A. B. Wynne.**]
Do. do. sheet 164 do. do., illustrating parts of the Counties of Cork and Limerick. 8vo. 1859. [Glac. & post-glac. 20—21: *Megaceros.*]

356 [**Jukes** (**Joseph Beete**), and **A. B. Wynne.**]
Do. do. sheet 135 do. do., illustrating parts of the county of Tipperary, and of King's and Queen's Counties. 8vo. 1860. [Glac. & post-glac. 30—32.]

357 [— —]
Do. do. sheet 188 and 189 do. do., illustrating parts of the Counties of Cork and Waterford. 8vo. 1861. [Glac. & post-glac. 20—21.]

358 [— —]
Do. do. sheets 176 and 177 do. do., illustrating parts of the Counties of Cork, Waterford, and a small portion of Tipperary. 8vo. 1861. [Glac. & post-glac. 28—29.]

359 [**Jukes** (**Joseph Beete**), **A. B. Wynne,** and **G. H. Kinahan.**]
Do. do. sheets 182, 183, 190, and parts of 172 and 191 do. do., illustrating the part of the County of Kerry, containing the Promontory of Iveragh and Dunkerron. 8vo. 1861. [Form of ground 5—8; glac. & post-glac. 31—34.]

360 [**Jukes** (**Joseph Beete**), **A. B. Wynne,** and **J. O'Kelly.**]
Do. do. sheet 145 do. do., illustrating part of the county of Tipperary. 8vo. 1860. [Glac. & post-glac. 30—31.]

361 **Kane** (Sir **Robert**).
The Industrial Resources of Ireland. 2nd ed. 8vo. Dublin, 1845. [Refs. to bogs, clays, &c.]

362 —
Anniversary Address [to Roy. Geol. Soc. I.]. *Journ. R.G.S.I.*, IV., 104—111. 1877. [Review of papers read.]

363 **Kelly** (**Dennis H.**).
[Account of an artificial Island, and certain Antiquities, recently discovered near Strokestown, County Roscommon.] *Proc. R.I.A.*, V. (1850-53), 208—214 (read 1851). 1853. [Bones of Elk, &c.]

364 **Kelly** (**John**).
An Account of the Strata met with in digging for Marle, and of Horns found under Ground in Ireland; in a letter to the Rt. Hon. Edward Southwell, Esq. *Phil. Trans.*, XXXIV. (1726-27), 122—123, plate. 1728. [*Megaceros.*]

365 **Kelly** (**John**).
On the Drift of the District about Rathfarnham in the County of Dublin. *Journ. G.S.D.*, VI., 133—165, map, &c. (read 1854). 1856. [Full descr., &c.]

366 **Kendall** (**Percy F.**).
Glacial Geology, Old and New. *Geol. Mag.*, (3) IX., 491—500. 1892. [Ref. to Irish beds.]

367 —
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368 Kendall (Percy F.).
Erratic Blocks of England, Wales, and Ireland. Twenty-third Report of the Committee . . . . . [Advance copy] *Brit. Assoc. Report for* 1895. [Report from B.N.F.C. on N. of Ireland erratics.]

369 Kilroe (James R.).
Explanatory Memoir to accompany sheet 55 of the Maps of the Geological Survey of Ireland, comprising parts of the counties of Sligo and Leitrim. 8vo. 1885. [Glac. & post-glac. 26—28.]

370 —
Directions of the Ice Flow in the North of Ireland, as determined by the Observations of the Geological Survey. *Q.J.G.S.*, XLIV., 827—833. 1888; and *Sci. Proc. R.D.S.*, n.s. VI., 259—262 (read 1888). 1888-90.

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See **Egan (192), Hull (306, 307), Symes (650, 654), Wilkinson (718** to **721).**

371 Kinahan (George Henry).
Explanation to accompany sheet 124 and that part of sheet 125 that lies on the west of Lough Derg of the maps of the Geological Survey of Ireland, illustrating parts of the counties of Galway and Clare. 8vo. 1863. [Caves 7; glac. & post-glac., *Megaceros*, 47.]

372 —
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373 —
On the Eskers of the Central Plain of Ireland. *Journ. G.S.D.*, X., 109—112 (read 1863). 1864; and *Dublin Q.J.S.*, IV., 109—112. 1864. [Classification: marine origin, &c.]

374 —
[Irish Drifts—a letter.] *Geol Mag.*, II., 91—93. 1865. [Classification.]

375 —
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376 —
Explanation to accompany sheets 115 and 116 of the maps, and sheets 17 and 18 of the sections of the Geological Survey of Ireland, illustrating a portion of the counties of Clare, Galway, and Tipperary. 8vo. 1865. [Caves, crannogs 7—9, 36—38; glac. & post-glac., marl shells, 13—15, 26—36; striæ 27.]

377 —
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Notes on some of the Drift of Ireland. *Journ. R.G.S.I.*, I., 191—207 (read 1866). 1867; and *Dublin Q.J.S.*, VI., 249—265. 1865. [Full paper: classification of drift.]

379 **Kinahan (George Henry).**

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383 —

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385 —

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386 —

Æolian Drift or Blowing Sand, Ireland. *Geol. Mag.*, VIII., 155—158. 1871. [Descr. and origin of sand deposits]

387 —

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388 —

Supplementary Notes on some of the Drift of Ireland. *Journ. R.G.S.I.*, III., 9—15 (read 1871). 1873. [General.]

389 —

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On the Origin of the Lagoon called The Fleet, Dorsetshire. *Geol. Mag.*, (2) I., 49—50. 1874. [Comparison with Irish lagoons.]

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394 —
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395 —
Valleys and their Relation to Fissures, Fractures, and Faults. 8vo. London, 1875. [Many refs. to glac. & post-glac. geology.]

396 —
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397 —
Irish Tide Heights and Raised Beaches. *Geol. Mag.*, (2) III., 78—82. 1876. [Table of tide heights; heights of tides and of raised beaches.]

398 —
An Outlier of Glacialoid or Re-arranged Glacial Drift on Stratified Gravel (Esker Period), Mourne Demesne, Co. Down. *Journ. R.G.S.I.*, IV., 122—123. 1877.

399 —
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400 —
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401 —
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402 —
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On the Chesil Beach, Dorsetshire, and Cahore Shingle Beach, County Wexford. *Q.J.G.S.*, XXXIII., 29—41, plate 2. 1877.

404 —
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411 —

[Remarks on Young's paper on wrought timber found in boulder clay (**749**).] *Journ. R.H. & A.A.I.*, (4) V. *iii.* (1881), 449—450. 1882. [An effect of weathering.]

412 —

Explanatory Memoir to accompany sheets 158 and 159 of the maps of the Geological Survey of Ireland, including the district around Enniscorthy, co. Wexford. 8vo. 1882. [Form of ground 7—8; glac. & post-glac. 19—37.]

413 —

Notes on Cervus megaceros (Megaceros hibernicus). *Trans. Edinb. Geol. Soc.* IV. *iii.* (for 1882-83), 343—345. 1883. [Distribution, &c.]

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***418** [—] [Nanahik, *Pseudonym*].

The Morrogh of Wicklow. *Land and Water*, XXIII., 45. 1887. [Formed by tides and winds.]

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Large Irish Boulders [a letter]. *Geol. Mag.*, (3) V., 189. 1888. [Dimensions of large erratics.]

420 Kinahan (George Henry).
Economic Geology of Ireland. [Being vol. VIII. of *Journ. R.G.S.I.*] 8vo. Dublin, 1889. [Ref. to clays, &c.]

421 —
Kitchen Middens in co. Donegal. *I.N.*, III., 138. 1894. [General note.]

422
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423 —
Kitchen Middens, co. Donegal. *I.N.*, IV., 21. 1895. [Short note.]

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See **Adams (9), Foot (206), Hull (307), Jukes (348** to **353, 359), Kinahan (760), Trench (668), Ussher (681, 681).**

424 [Kinahan (George Henry) and **J. Beete Jukes).]**
Explanations to accompany sheet 143 of the maps of the Geological Survey of Ireland, illustrating part of the Counties of Clare and Limerick. 8vo. 1860. [Glac. & post-glac., *Megaceros*, 8—9, 33—34.]

425 [Kinahan (George Henry), J. Beete Jukes, and **F. J. Foot.]**
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426 [Kinahan (George Henry) and **F. J. Foot.]**
Do. do. sheet 142 do. do., illustrating parts of the Counties of Clare, Kerry, and Limerick. 8vo. 1860. [Glac. & post-glac. 39—40.]

427 Kinahan (George Henry), H. Leonard and **R. J. Cruise.**
Explanatory Memoir to accompany sheets 104 and 113 with the adjoining portions of sheets 103 and 122 (Kilkieran and Aran sheets) do. do., illustrating a portion of the County of Galway. 8vo. 1871. [Glac. & post-glac., sea-cliffs (Aran) 31—37; glac. & post-glac. (mainland), kitchen-middens 69—74; table of striæ 75—85.]

428 Kinahan (George Henry), and **Joseph Nolan.**
Explanation to accompany sheet 95 do. do. . . . illustrating parts of the counties of Galway and Mayo. 8vo. 1870. [Lough Corrib islands 30—36; L. Mask islands 45; glac. & post-glac. 45—52: table of striæ 53—58.]

429 Kinahan (George Henry), J. Nolan, H. Leonard, and **R. J. Cruise.**
Explanatory Memoir to accompany sheets 93 and 94, with the adjoining portion of sheets 83, 84, and 103 do. do., illustrating the geological structure of the district around Clifden, Connemara. 8vo. 1878. [Drift bar 13; denudation 44—47; glac. & post-glac. 143—144; table of striæ 145—160.]

430 [Kinahan (George Henry,) J. O'Kelly, and **J. Beete Jukes.]**
Explanation to accompany sheet 153 do. do., illustrating parts of the Counties of Limerick and Cork. 8vo. 1861. [Glac. & post-glac. 28.]

431 Kinahan (George Henry) and **R. G. Symes.**

Explanatory Memoir to accompany sheets 86, 87, 88, and eastern part of 85 do. do., illustrating parts of the counties of Mayo, Galway, Roscommon, and Longford. 8vo. 1871. [Frontispiece, eskers; form of ground 7—9; glac. & post-glac. 49—54; striæ 39, 55—57]

432 Kinahan (George Henry), R. G. Symes, S. B. Wilkinson, Joseph Nolan, and **H. Leonard.**

Do. do. sheets 73 and 74 (in part), 83 and 84 do. do. including the Country around Westport, &c. 8vo. 1876. [Glac. & post-glac. 11, 69—75; table of striæ 75—82.]

433 Kinahan (George Henry), S. B. Wilkinson, J. Nolan, F. W. Egan [and **E. Hull**].

Do. do. sheet 17 and S. E. portion of sheet 11 do. do. 8vo. 1889. [Donegal, Derry, Tyrone. Phys. geogr. 5—6; glaciation 28; glac. & post-glac. 28—32]

434 [Kinahan (George Henry), A. B. Wynne and **J. Beete Jukes.]**

Explanations to accompany sheet 134 do. do., illustrating parts of the counties of Clare, Tipperary, and Limerick. 8vo. 1861. [Glac. & post-glac., *Megaceros*, 8—9, 29—31.]

435 Kinahan (Gerard A.).

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437 Kinahan (John Robert).

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438 —

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439 King (Prof. **William**).

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440 King (Right Rev. Dr. **William**), Archbishop of Dublin.

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441 Knowles (William James).

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442 **Knowles (William James).**
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443 —
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455 **Knowles (William James).**

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465 —

Kitchen Middens of Donegal. *I.N.*, IV., 80. 1895. [Short note.]

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467 **Lentaigne (John).**

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468 **Leonard (Hugh).**

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469 Leonard (Hugh).
Explanatory Memoir to accompany sheets 68 and 69 of the Maps of the Geological Survey of Ireland, illustrating parts of the Counties of Cavan, Leitrim, and Roscommon. 8vo. 1878. [Roches moutonnées 11 ; glac. & post-glac. 21—22.]

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See **Kinahan (427, 429, 432)**.

Leonard (W. B.), see **Hull (308, 310, 311)**.

470 Leonard (W. B.), and **R. J. Cruise.**
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Description of an ancient Structure dug out of Drumkelin Bog, in the Parish of Inver, County of Donegal, in the year 1833. *Archæologia*, XXVI., 361—367 (read 1833). 1836. [Wooden house under 16 feet of bog.]

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555 Patterson (William Hugh).

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558 Percy (Rev. Dr.), Bishop of Dromore.

Extract of a letter from, to the Rev. Dr. Lort, on some large Fossil Horns. *Archæologia*, VII., 158—159. 1785. [*Megaceros* horns, size only.]

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On the Exploration of the Knockninny Cave. With an Account of the Animal Remains, by Rev. Prof. Haughton and Prof. Macalister. *Proc. R.I.A.*, (2) II. (*Science*), 465—483. 1875-77. [Descr.: implements: bones.]

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569 Portlock (General **Joseph E.**).
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570 —
On the Shelly Gravel underlying Dundalk. *Journ. G.S.D.*, I., 246—248 (read 1834). 1837. [Recent marine deposits.]

571 —
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Report on the Geology of the County of Londonderry . . . 8vo. Dublin, 1843. [Ch. I. Review of works of preceding writers. Ch. VI., Tertiary—calcareous clays (with list of fossils, Portrush raised beach, by J. Smith). Ch. IX. p. 473, mammalian remains. Ch. XIII., Detritus. Appendix: addendum to Ch. VI., with Bryce and Hyndman's paper and list of fossils, Belfast Waterwork boulder clay (**111**).]

573 —
[Annual] Address [to Geol. Soc., Dublin.] *Journ. G.S.D.*, IV., 167—244. 1850. [Review of papers read.]

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580 —

[Exhibited bones of Irish Elk.] *Proc. B.N.F.C.*, (2) III., 422—423 (for 1891-92). 1892. [From gravel below peat below marine clay at Belfast.]

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The Mourne Mountains. *Proc. Geol. Assoc.*, XIV., 148—152. 1895. [Ref. to glac & post-glac. beds.]

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593 —
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594 Reeves (Rev. William) [afterwards Bishop of Down and Connor and Dromore].
[Supplementary observations on Wilde's paper on certain Crannogs in Ulster (**694**).] *Proc. R.I.A.*, VII. (1857-61), 153—159 (read 1859). 1862. [Descr. of additional crannogs.]

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597 Richardson (H. D.).
The Extinct Gigantic Deer [a letter]. *Farmer's Gazette*, V., 538—539. 1846. Reprinted in *Zool.*, V., 1623-1628. 1847. [Lough Gur find.]

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On an Attempt to elucidate the History of the Cervus Megaceros, commonly called the Irish Elk. *Sci. Proc. R.D.S.*, n.s. II., 105—111. 1880. [Age and cause of extinction.]

724 —

On the Occurrence of *Megaceros Hibernicus*, Owen, in the Ancient Lacustrine Deposits of Ireland, with Remarks on the Probable Age of these Beds. *Geol. Mag.*, (2) VIII., 354—363. 1881. [Descr. of Ballybetagh; age of *Megaceros*; climate.]

725 Williams (W. Mattieu).

Notes on the Glaciation of Ireland and the Tradition of Lough Lurgan. *Brit. Assoc. Report for* 1878, 528—529. 1879. [Geographical features caused by glaciation.]

726 Windele (John).

Historical and Descriptive Notices of the City of Cork and its vicinity . . . . 8vo. Cork, 1840. [Refs. to caves, pp. 188 (Carrigacrump), 220 (Ovens).]

727 —

On an Ancient Cemetery at Ballymacus, County of Cork. *Trans. Kilk. Arch. Soc.*, II. *ii.* (1853), 230—239. 1854. [Ref. to Castlemartyr cave and elk teeth.]

728 **Wood (Searles V.)**, jun.
Observations on the Sequence of the Glacial Beds. *Geol. Mag.*, VII., 17—22, 61—68. 1870. [Ref. to Wexford beds, pp. 17—18.]

729 —
Further Remarks on the Sequence of the Glacial Beds. *Geol. Mag.*, VIII., 406—412. 1871. [Ref. to Wexford beds.]

730 **Wood-Martin** (Lt.-Col. **W. G.**).
The Lake-dwellings of Ireland . . . 8vo. Dublin and London, 1886. [Much information.]

731 —
Description of a Crannog Site in the County of Meath. *Proc. R.I.A.*, (2) II. (*Polite Lit. & Antiquities*) (1879-88), 480—484 (read 1866). 1888.

732 —
Pagan Ireland: an Archæological Sketch. 8vo. Dublin, 1895.

—
See also **766.**

733 **Wright (Edward Perceval).**
Notes of a visit to Mitchelstown Caves. *Brit. Assoc. Report for* 1857, *Sections*, 108—109. 1858. [Abstract]; and *Nat. Hist. Review* IV., 231—241. 1857. [Present fauna.]

734 **Wright (Joseph).**
Post-Tertiary Foraminifera of the North-east of Ireland. *Proc. B.N.F.C.*, (2) I., 428—429 (for 1879-80), 1881 [abstract]; and do. (2) I., *Appendix* for 1879-80, 149—163. 1881. [Of boulder clays, estuarine clays, and raised beaches.]

735 —
The Occurrence of Boulder Clay on Divis. *Proc. B.N.F.C.*, (2) IV. 215—216 (for 1894-95). 1895. [Marine clay at 1300—1400 feet, Co. Antrim.]

736 **Wynne (Arthur B.).**
Explanations to accompany sheet 126 (and the portion of 125 lying to the east of the Shannon) of the Maps of the Geological Survey of Ireland, illustrating parts of Tipperary and the King's and Queen's Counties. 8vo. 1862. [Glac. & post-glac. 9, 13—14; detailed descr. 14—36.]

737 —
Irish Drift Fossils. *Geologist for* 1862, 428—429. [*Mytilus* in gravel-pit south of Sligo.]

738 —
On the Geology of part of Sligo. *Brit. Assoc. Report for* 1862, *Sections*, 96—97. 1863. [Abstract]; also *Journ. G.S.D.*, X., 31—41 (read 1863). 1864; and *Dublin Q.J.S.*, III., 171—179. 1863. [Ref. to shelly drift and mammalian remains.]

739 —
On Denudation with Reference to the Configuration of the Ground. *Geol. Mag.*, IV., 3—11, plates 1—2. 1867. [Ref. to submerged peat, Youghal Bay.]

740 Wynne (Arthur B.).

On Disturbance of the Level of the Land near Youghal, on the South Coast of Ireland. *Q.J.G.S.*, XXIV., 4—8. 1868. [Glac. & post-glac. beds; shells.]

741 —

On the Disturbance of the Level of the Land near Youghal. [A letter.] *Geol Mag.*, V., 484—485. 1868. [Answer to criticisms by Greenwood.]

742 —

Explanatory Memoir to accompany sheets 42 and 43 of the Maps of the Geological Survey of Ireland, comprising portions of the Counties of Sligo and Leitrim. 8vo. 1885. [Glac. & post.-glac. 27—28; caves 28; striæ 30.]

743 —

Note on Submerged Peat Mosses and Trees in certain Lakes in Connaught. *Sci. Proc. R.D.S.*, n.s. V., 499—503. 1886-87; and *Journ. R.G.S.I.*, VII., 186—190. 1887.

—

See **Jukes (343** to **345, 355** to **360), Kinahan (434), O'Kelly (533).**

744 Wynne (Very Rev. **G. R.**).

Traces of Ancient Dwellings in the Sandhills of West Kerry. [Note.] *Journ. R.S.A.I.*, (5) III., 78—80. 1893. [Bones, &c.]

Young (Arthur), see **767.**

745 Young (Robert).

On the Eskers of the Central Plain of Ireland. *Brit. Assoc. Report for* 1852, *Sections*, 63—64. 1853. [Submergence theory.]

746 —

The recent Elevation of the Land in the Vicinity of Belfast. [Abstract.] *4th Ann. Report B.N.F.C.* (for 1866-67), 20—22. 1867. [General descr.]

747 —

The Boulder Clay of the Belfast District. [Abstract.] *8th Ann. Report B.N.F.C.* (for 1870—71), 32—35. 1871. [General.]

748 —

Some Remarks on the recent Changes of coast Level at Ballyholme Bay, Co. Down. *Proc. B.N.H. & P.S. for* 1871-72, 39—40. 1873. [Boulder clay, peat, raised beach.]

749 —

[Wrought logs in boulder-clay near Belfast.] *Journ. R.H. & A.A.I.*, (4) V. *ii.* (1880), 307—308. 1882.

750 —

Some Notes on the Upper Boulder Clay near Belfast. [Abstract.] *Proc. B.N.H. & P.S. for* 1889 90, 57. 1890.

751 —

Notes on the Geology of the Excavations for the Main Drainage Works [Belfast]. [Abstract.] *Proc. B.N.H. & P.S. for* 1890-91, 89. 1892.

752 Young (Robert Magill).
Brief Antiquarian Notes at Bushfoot and Ballymagarry [Co. Antrim]. *Proc. B.N.H. & P.S. for* 1892-93, 37—34. 1894. [Ref. to Bushfoot sandhill finds.]

753 —
On a Recent Find of Irish Elk Bones, &c., in Belfast. *Proc. B.N.H. & P.S. for* 1893-94, 76—78. 1894; and *I.N.*, III., 81—82. 1894. [In cuttings in Belfast streets.]

—
See **Belfast N.H. & P.S. (44).**

ADDENDA.

754 [Campbell (Thomas).]
A Philosophical Survey of the South of Ireland, in a series of Letters to John Watkinson, M.D. 8vo. Dublin, 1778. [Dunmore cave, p. 106.]

755 Carpenter (George Herbert).
Animals found in the Mitchelstown Cave. *I.N.*, III., 25—35, plate 1. 1895; reprinted (in part) in *Spelunga: Bulletin de la Société de Spéléologie*, I. *i.* Paris, 1895. [Present fauna.]

756 Close (Rev. Maxwell H.).
On the Geology of the Neighbourhood of Dublin as affecting its Sanitary Conditions. [Read Oct. 3rd, 1884, at Congress of the Sanitary Institute of Great Britain, held at Dublin. 8 pp. Authors's copy, headed "Excerpt from vol. VI. of the *Transactions*" &c.] [Descr. of beds underlying the city.]

757 [Cromwell (Thomas Kitson).]
Excursions through Ireland. 3 vols. 12mo., no date. [1818.] [Dunmore cave, II., p. 58.]

758 Foot (Frederick J.).
Natural History Notes on the Mammalia of the West coast of Clare. *Proc. Dublin Nat. Hist. Soc.*, III. (1859-62), 104—106. 1863. [Caves.]

759 Hardman (Edward T.).
The Limestone Caves of Sligo. [Appendix A. (pp. 375—378) of Wood-Martin's "History of Sligo," I. 8vo. Dublin, 1882. [Localities.]

760 Kinahan (George Henry) and M. H. Close.
The Glaciation of Iar-Connaught and its neighbourhood. 8vo. Dublin, 1872. [Important paper.]

761 [Luckombe (Philip).]
A Tour through Ireland, wherein the present state of that Kingdom is considered . . . . 12mo. Dublin, 1780. [Caves. Cork and Kerry, pp. 130—131, 134, 190, 282.]

762 Mallet (Robert).

On some Stalagmites from the Cave of Dunmore, County of Kilkenny. *Journ. G.S.D.*, III. *iii.*, 262—263. 1846. [Short abstract.]

763 Ryland (Rev. **R. H.**).

The History, Topography, and Antiquities of the County and City of Waterford. 8vo. London, 1824. [Refs. to caves.]

764 Savage (John).

Picturesque Ireland . . . . 4to. New York, no date. [Bursting of a bog at Dunmore, North Galway, p. 264.]

765 White (Rev. **P.**).

History of Clare . . . . 8vo. Dublin, 1893. [Cave at Kiltannon, p. 2.]

766 Wood-Martin (Lt.-Col. **W. G.**).

History of Sligo, County and Town. [Vol. III]. 1688 to present time. 8vo. Dublin, 1892. [Ch. XXIV., Geology, &c.; boulder clay, bogs, raised beaches, crannogs, caves.]

See **Hardman (759).**

767 Young (Arthur).

A Tour in Ireland . . . . made in the Years 1776, 1777, and 1778 and . . . 1779. 4to. London, 1780. [Mitchelstown cave, 380—381 (I., 464—465 of Hutton's ed., 1892).]

INDEX.

NOTE.—It must be understood that the following indexes, being compiled from the titles of the papers, and from the brief indication of their contents appended, are not exhaustive. They are intended as a rough guide to the papers, &c., dealing with any particular group of beds, or with any particular district. By consulting the papers indicated under any group, and also the papers indicated in the "general" list at the head of the section (A or B), a tolerably complete list will be obtained of papers dealing with the group in question; but for a complete list of references the Bibliography itself must be looked through.

SECTION A.—GEOLOGICAL INDEX.

GROUP 1—GENERAL.

(Papers referring to various formations.)

3 4 5 27 32 33 34 39 45 85 90 92 133 135
136 148 149 150 151 152 178 184 186 187 188 189 190 191
192 200 201 202 205 206 207 208 209 217 240 244 257 259
260 270 283 284 288 295 297 300 301 304 305 306 307 308
309 310 311 322 323 324 333 334 335 337 340 241 342 243
345 347 348 349 350 351 352 353 354 355 356 357 358 359
360 361 369 371 376 380 382 395 405 408 412 420 424 425
426 427 428 429 431 432 433 434 439 469 470 485 486 492
493 496 505 506 525 526 527 528 529 531 532 533 535 572
585 586 592 609 645 646 647 648 649 650 651 652 653 654
655 656 657 716 717 718 719 720 721 736 742

GROUP 2—PLIOCENE.

(Chiefly Wexford gravels.)

87 88 89 90 93 254 257 258 263 316 387 641 728 729

GROUP 3—GLACIATION, STRIÆ.

10 35 58 63 68 74 82 118 128 129 130 131 139 140
177 188 189 203 228 239 259 281 289 294 297 301 307 309
310 330 370 376 377 382 427 428 429 431 432 433 436 469
474 536 545 575 624 646 647 648 651 653 657 659 660 667
719 725 742 760

Group 4—Glacial Deposits, Erratics.

11	13	47	48	51	56	57	62	65	66	67	69	72	73
76	77	78	81	84	87	88	89	97	108	110	111	132	137
138	139	171	172	173	174	175	176	213	214	222	224	242	243
246	250	253	254	255	258	272	290	291	293	302	314	320	327
328	336	338	339	344	345	350	365	366	368	373	374	375	378
387	388	389	392	393	394	398	399	402	404	406	407	414	415
419	435	437	441	462	474	484	488	494	537	538	539	541	542
568	575	583	587	589	590	591	593	603	604	612	620	622	625
626	627	628	629	631	637	638	641	642	644	659	660	661	666
706	728	729	735	737	738	740	745	747	748	750	757	760	766

Group 5—Post-glacial in General.

31	389	399	440	487	544	569	570	576	588	621	635	734	751
756	766												

Group 6—Submerged Peat, Bogs, Marl.

16	21	23	25	36	37	40	42	50	59	67	143	165	169
185	197	205	207	211	218	245	286	308	319	364	376	382	400
416	483	495	502	513	514	518	519	521	546	552	559	566	579
596	620	623	630	682	724	739	740	743	748	764			

Group 7—Post-glacial Clays.

64	220	221	400	551	576	577	578	581	582	616	636	643

Group 8—Raised Beaches.

29	50	52	58	64	71	75	83	91	165	180	221	222	237
252	273	292	295	304	315	397	453	457	515	554	574	577	584
615	618	639	643	732	748								

Group 9—Caves and Cave-Deposits.

2	7	8	9	12	15	19	20	28	55	79	101	102	103
105	106	107	109	120	142	145	147	149	152	155	198	199	202
231	256	267	296	371	376	438	510	511	524	525	551	562	563
564	565	601	602	607	608	645	665	670	671	673	674	676	678
679	680	687	688	689	726	727	732	733	742	754	755	756	757
758	759	761	762	763	765	766	767						

Group 10—Vertebrate Fossils.

2	3	4	5	6	9	18	21	23	24	25	26	31	36
37	38	39	40	41	56	60	94	98	99	100	101	102	103
106	109	117	119	120	121	122	123	124	125	134	146	153	154
156	157	160	162	163	164	176	179	186	187	198	202	206	215
216	219	222	223	226	235	248	256	262	264	266	267	268	269
276	277	278	279	280	285	286	287	300	301	308	323	325	326
329	331	353	355	364	371	413	424	434	467	471	475	481	482
483	489	501	503	508	509	515	518	520	522	523	540	547	548
549	550	553	558	559	560	562	564	567	576	579	580	596	597
598	599	600	601	602	605	608	609	610	611	614	616	619	645
662	663	664	665	667	669	678	679	680	683	684	701	702	703
705	709	710	714	722	723	724	727	738	753				

Group 11—Invertebrate Fossils.

31	33	47	85	86	87	88	89	90	91	92	93	104	110
111	132	144	169	197	205	207	210	220	221	222	243	252	260
263	295	297	304	308	312	313	314	316	317	318	365	367	376
382	437	486	487	493	500	535	537	538	572	576	577	578	583
584	591	612	615	622	623	626	628	629	636	637	639	641	642
643	647	652	660	664	666	699	700	734	735	737	738		

Group 12—Prehistoric Settlements.
(Crannogs, kitchen-middens, sandhill sites, &c., and associated remains.)

1	17	22	30	63	95	115	116	141	166	167	168	170	193
196	225	230	234	261	265	271	274	275	282	332	363	372	376
379	381	384	385	396	421	423	427	442	444	446	447	448	450
455	456	459	460	464	465	466	468	476	477	478	489	490	491
497	504	507	514	516	517	519	530	555	556	557	566	594	595
632	645	658	668	670	671	672	675	677	681	682	685	686	690
691	692	693	694	695	697	698	704	705	707	712	715	730	731
732	744	749	752	766									

Group 13—Prehistoric Implements, Utensils, &c.

29	42	46	48	49	52	53	54	58	59	61	64	65	80
96	112	113	114	126	156	158	159	161	180	181	183	185	194
195	212	227	229	231	232	233	235	236	237	238	273	441	443
445	449	452	453	454	457	458	461	462	463	473	479	489	512
534	561	562	618	633	639	643	667	678	679	680	698	701	702
708	711	713	732										

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411 417 418 422 427 429 574 640 739

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681 740 741 743 746 748

Group 16—Climate of Past Epochs.

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SECTION B—GEOGRAPHICAL INDEX.

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(Papers dealing with many localities, or with general considerations.)

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122 129 140 143 153 154 156 157 162 163 164 168 177 182
193 195 210 213 214 217 218 222 223 227 230 231 232 238
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283 284 285 287 288 290 291 292 293 294 296 297 303 318
320 321 323 324 329 332 333 361 362 364 366 367 368 370
373 374 378 383 385 386 387 388 389 390 391 392 393 394
395 397 399 401 404 405 406 407 409 413 415 419 420 422
439 443 446 447 448 452 453 454 457 458 459 460 461 463
466 467 472 474 479 480 481 482 493 494 498 499 501 503
508 513 520 523 534 535 537 538 542 547 548 549 553 558
569 571 573 574 581 582 586 587 588 589 590 594 596 599
600 605 606 607 609 610 611 613 617 622 625 634 635 638
656 659 660 661 662 664 673 674 675 676 682 693 697 708
709 710 711 713 714 723 724 725 730 732 739 743 745

2—Co. Antrim.

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56 59 62 63 64 66 67 70 75 76 77 80 83 91
96 104 109 110 111 112 113 115 126 158 159 180 181 183
190 191 194 197 212 220 221 224 226 228 229 232 233 234
235 236 237 251 254 257 258 273 295 310 312 313 314 317
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477 478 484 485 486 487 490 491 492 495 497 500 502 515
572 577 578 579 580 583 587 592 604 618 621 623 624 635
636 637 639 641 643 644 647 649 651 694 696 699 700 712
734 735 746 747 749 750 751 752 753

3—Co. Armagh.

150 151 186 187 188 189 194 251 257 525

4—Co. Carlow.

259 305 322 351 414 702

5—Co. Cavan.

248 251 261 469 470 504 509 522 653 658 691 715 717 719

6—Co. Clare.

199 202 205 206 353 371 376 424 426 434 438 530 705 706
758 765

7—Co. Cork.

1 7 13 17 30 105 140 141 142 145 147 152 175 262
265 319 327 328 336 338 340 344 349 350 352 355 357 358
430 575 620 670 726 727 739 740 741 761

8—Co. Donegal.

44 192 239 251 270 271 272 306 307 309 416 417 421 423
433 440 465 496 497 519 557 584 616 648 704 718

9—Co. Down.

14 23 45 48 57 60 61 65 68 69 71 72 73 74
78 81 82 165 166 169 183 186 197 229 232 251 275 301
310 311 398 450 473 475 485 486 487 554 555 556 576 578
585 592 633 635 636 637 666 667 703 734 748

10—Co. Dublin.

32 33 121 124 128 132 133 136 137 138 139 171 173 174
216 260 290 298 299 300 304 337 342 365 437 518 540 543
544 567 568 591 593 612 615 622 626 627 629 722 723 724
756

11—Co. Fermanagh.

42 55 79 150 151 161 251 277 278 279 562 563 564 565
566 648 653 684 685 686 687 688 689 690 692 693 695 717
719 720 721

12—Co. Galway.

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384 402 427 428 429 431 432 468 532 545 546 559 657 760
764

13—Co. Kerry.

12 35 131 143 172 175 201 211 289 328 335 336 339 341
346 347 349 352 359 425 426 603 744 761

14—Co. Kildare.

173 174 184 300 343 348 351

15—Co. Kilkenny.

134 178 198 200 209 256 267 286 322 334 351 489 510 551
560 601 602 665 698 754 755 762

16—King's Co.

170 184 208 245 343 356 507 532 632 736

17—Co. Leitrim.

149 251 369 469 470 653 712 717 742

18—Co. Limerick.

21 25 40 98 121 123 125 146 160 215 219 280 344 349
353 354 355 424 425 426 430 434 483 550 597 598 701 702

19—Co. Londonderry.

86 135 176 189 190 191 196 247 251 272 274 315 433 440
442 444 446 448 449 456 488 527 528 529 572 578 595 616
624 637 642 649 734

20—Co. Longford.

40 148 203 204 208 251 325 326 331 431 470 712

21—Co. Louth.

58 138 251 304 308 525 570

22—Co. Mayo.

97 149 242 243 251 428 431 432 505 645 646 650 652 654
655 666 716 760

23—Co. Meath.

144 148 171 173 174 179 184 251 304 308 337 470 614 669
683 684 707 731

24—Co. Monaghan.

150 151 188 248 251 308 471 509 516 517 522 525 719

25—Queen's Co.

170 200 276 343 348 351 356 375 531 532 668 736

26—Co. Roscommon.

149 207 208 251 363 431 469 470 716

27—Co. Sligo.

149 242 251 369 608 650 654 737 738 742 759 766

28—Co. Tipperary.

19 20 24 28 178 200 209 334 344 345 353 354 356 358
360 376 434 511 524 532 533 668 682 733 736 755 767

29—Co. Tyrone.

151 167 189 192 251 257 417 433 521 526 527 528 561 663
718 720 721

30—Co. Waterford.

2 7 8 9 101 102 103 106 107 120 127 155 178 252
282 345 357 358 619 671 672 677 678 679 680 681 763

31—Co. Westmeath.

38 148 184 185 208 225 251 630 631

32—Co. Wexford.

87 88 89 90 178 259 263 305 316 322 400 403 408 409
412 414 552 728 729

33—Co. Wicklow.

33 128 137 139 259 300 302 305 342 409 410 418 435 436
506 512 514 536 539 541 591 593 622 628 640

APPENDICES VII. and VIII.

(Vol. II.)

TO

PROCEEDINGS

OF

BELFAST NATURALISTS' FIELD CLUB,

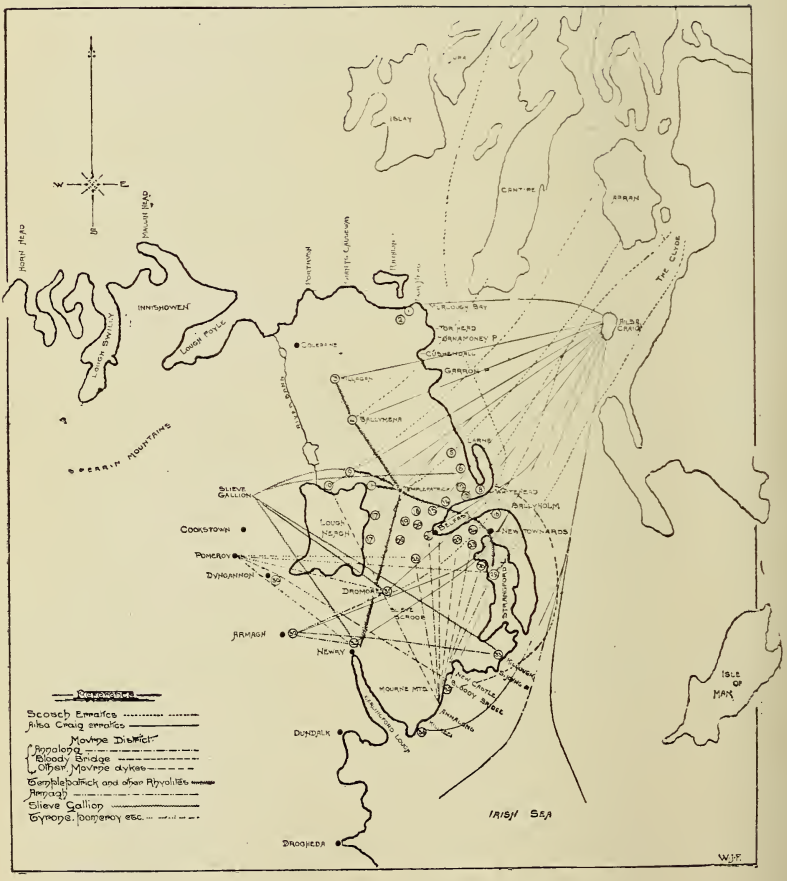
1906.

BRITISH MUSEUM NATURAL HISTORY

Belfast:
PRINTED AT THE "BELFAST NEWS-LETTER" OFFICE,
55, 57, & 59 DONEGALL STREET.

1906.

BRITISH MUSEUM
NATURAL HISTORY



N.-E. IRELAND.

SHOWING DISTRIBUTION OF ERRATICS.

A SUMMARY

OF

RECENT GLACIAL INVESTIGATIONS

BRITISH MUSEUM NATURAL HISTORY

BY THE

BELFAST NATURALISTS' FIELD CLUB.

COMPILED BY

MADAME RODOLPHE CHRISTEN

(MISS SYDNEY M. THOMPSON).

Being an Appendix (No. 7 of Vol. II.) to the Proceedings of the Belfast Naturalists' Field Club, for 1905-6.

APPENDIX.

SUMMARY OF RECENT GLACIAL INVESTIGATIONS BY THE BELFAST NATURALISTS' FIELD CLUB.

Compiled by Madame Rodolphe Christen (Miss Sydney M. Thompson).

Fully a dozen years have elapsed since a circular was sent to our Club by Mr. Percy F. Kendall, M.Sc., Secretary of the British Association Erratic Blocks Committee, requesting the Club to co-operate by examining the glacial phenomena of our district, with especial reference to the distribution of erratics in the drift. A ready response was given by the Club, and a geological section formed for the express purpose of conducting the inquiries, and a collection of Irish rocks commenced, to assist in identifying the parent locality from which the erratics had travelled, specimens of Scotch rocks likely to occur being presented by Mr. Kendall. A room was acquired at the Museum where meetings could be held and collections and instruments stored. The patient accumulation of a multitude of details on many points was willingly undertaken by many members of the Club, as well as by the little group specially appointed; and erratics from outlying districts were received from time to time, invaluable assistance being also given by Mr. S. A. Stewart, A.L.S., F.B.S.E., and Mr. Joseph Wright, F.G.S., whose works on the Mollusca[1] and Microzoa[2] of our boulder clays rank amongst the classics of British glacial literature.

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1. Mollusca of the Boulder clay of the N.E. of Ireland. Proc. B.N.F.C. (2) I. Appendix for 1879-80, p. 165.
2. Post-tertiary Foraminifera of the N.E. of Ireland. Proc. B.N.F.C. (2) I. 1879-80, p. 428.

The work was commenced on the 12th of August, 1893, when Miss Mary K. Andrews, Mr. Stewart, and the writer visited a fine section of boulder clay 25 feet in depth, exposed (in making subway) at Greenisland Railway Station. A short description of the work may be of interest, as all subsequent examinations were similarly conducted, sometimes by solitary workers, sometimes by the whole geological section, but usually by two or three members, amongst whom I must gratefully single out Miss Andrews and Mr. Robert Bell, whose unwearying toil made this summary a possibility.

Boulder clay usually contains innumerable stones of all sizes embedded irregularly throughout its mass. Of these 100 or more stones were selected at random, broken and counted to give the percentage of erratics, an erratic being defined as "any stone found in a glacial deposit that is not resting on its parent rock, no matter how short a distance it may have travelled." The subjacent rock at Greenisland being Trias, every stone not of Triassic origin was an erratic, and it was surprising and interesting to note what a varied assortment occurred, varying in size from chalk boulders, five feet long, down to tiny pebbles of far-travelled rocks from Scotland, Ailsa Craig, North Antrim, Derry, and Tyrone, and large, beautifully-scored, and polished blocks of Silurian slate, hailing from either Scotland or the County Down. Shells were looked for, and bags of the clay collected to be submitted to Mr. Wright for microscopical examination. This is the most troublesome and tedious process connected with our researches, involving hours of monotonous labour on Mr. Wright's part, with only occasional assistance from Miss Smythe, as sometimes several pounds of stiff clay when washed, dried, and floated, yield one tiny foraminifer too small to be visible to the naked eye!

Fossils found in the clays were carefully collected, and photographs of the section taken by Miss Andrews for future reference. Specimens of well-known rocks were listed in the field, other fragments being brought to the Museum to be numbered, mounted, labelled, and submitted to Mr. Stewart, Mr. J. St. J. Phillips, A.R.I.B.A., or Mr. Seymour to ascertain their

place of origin. Unknown erratics were from time to time forwarded to Dublin to Mr. A. M'Henry, M.R.I.A., of the Geological Survey of Ireland, whose unrivalled acquaintance with Irish rocks was always generously placed at our service; to Professor Grenville A. J. Cole, M.R.I.A., F.G.S. (to whose warm sympathy and kindly help our geological section owes so much), to Professor W. W. Watts, F.R.S., and others, whose special knowledge made them able to identify the rarer erratics, and I gladly acknowledge the great assistance thus kindly given. Immense aid was also obtained from the fine Bibliography of Irish Glacial Geology[3] expressly compiled for this purpose by Mr. R. Lloyd Praeger, B.E., M.R.I.A.

We have more than a hundred different erratics in our Club collection; 11 of these are unquestionably Scotch, 10 others may be of Scotch or Northern Irish origin, the remaining 86 being Irish. An erratic of Ballachulish slate is our most northerly specimen, others from the Clyde Area, Cantyre, and fragments of fossiliferous Silurian rocks from Girvan carry us southward to Ailsa Craig, whose unique riebeckite rock is so widely distributed in our boulder clays. Passing to Ireland, we find fragments from the primary rocks of North Antrim, Derry, and Tyrone, others from Cultra, Castle Espie, the Coasts of Down, and from Armagh, joining the icy procession until we reach in the pretty pink eurite found near Annalong our most southerly parent rock.

A remarkable change has come over geological thought with regard to the glacial period in the dozen years that have elapsed since our section commenced its work; gradually the controversy as to the origin of our drifts has died away, as the conception of a vast ice sheet from various confluent sources moving over our islands, grinding solid rocks, picking up and transporting fragments of every material met in its progress, transforming the surface of the country by erosion and deposition, became widely accepted. The issues to be studied were

3. A Bibliography of Irish Glacial and Post-glacial Geology. By R. Lloyd Praeger, B.E., B.N.F.C. Proc. 1895-6.

also vastly simplified, resolving themselves chiefly into the transport of erratics as indications of the directions of ice-flows; the presence or absence of marine organisms remaining an important factor in differentiating between ice-sheets of inland and transmarine origin.

Let us pass in imagination backwards over an unknown but vast number of centuries to a period when Arctic conditions prevailed over Northern Europe, and mighty confluent fields of ice slowly travelled onward, traversing the North Channel, the Clyde, and the Irish Sea, grinding out deep troughs in the sea floor where such an obstacle as Rathlin Island obstructed the lower layers, enveloping it, Ailsa Craig, and the Isle of Man, overflowing eastward into England, and entering Ireland westward over the noble promontory of Fair Head, the first in our list of localities recorded in this summary.

The iceworn summit of Fair Head is strewn with erratics from many points of the compass, and strolling further south we observe many large blocks resting on the cliffs that encircle Murlough Bay. Noticing one of schist we ponder on its origin. Was it torn from a bed of similar rock on the shore many hundred feet below, or was it borne on ice 20 miles across the sea from similar rocks in Cantyre, whose fragments are scattered over Rathlin? Glancing at the tiny handful of pebbles gathered at random over Fair Head, which include a small, rounded fragment of Ailsa Craig, which lies due east, one from a point near Torr Head to the S.E., a bit of chert, old red conglomerate, and a peculiar smooth-looking green felsite from Scotland or North Antrim, we see the significance of studying the distribution of erratics and the important deductions to be drawn from their presence on these Ballycastle headlands

Our summary includes 36 localities, and we will follow the course of the intrusive ice southwards, first considering the distribution of erratics from Ailsa Craig which are much worn, indicating severe ice action, even some specimens dredged by Mr. Welch 40 fathoms deep off Rathlin were ground completely smooth. It occurred at 26 out of our 36 localities, has been found round our shores by Mr. Welch at Portrush in sandhills,

by Miss Andrews at Portstewart and at Kilkeel, by Mr. H. J. Seymour, F.G.S., away down at Waterford and Youghal, and by Messrs. W. B. Wright, B.A., and H. B. Muff, B.A., F.G.S., at Whiting Bay and other Cork localities.[4]

Its absence from 10 of our localities is worth analysing, as in some cases this seems to tally with other circumstances suggesting a special period for these deposits. Although none was found at No. II., a drift-filled valley on Fair Head, fragments occur as loose drift half a mile away. Gleno, VI., Cave Hill, XV., and Divis, XIX., are small deposits of very local rocks; Wolfhill, XVIII., and Dungannon, XXX., have not been fully investigated, and Killough, XXXIII., and Bloody Bridge, XXXV., have special features suggesting that they may be the product of later local glaciations. Although none was found in Castle Espie, XXVIII., boulder clay, fragments are frequent as loose erratics on the shore of Strangford Lough, XXIX., and Mr. J. O. Campbell found an isolated morsel on Spinkwee mountain in the Mourne range. In spite of careful search, Mr. Bell never found any west of the Bann until this year, when he picked up a solitary piece on the shore of Lough Neagh, near Moyola River.

Passing southward to No. III., the esker ridges about Killagan and Glarryford, we have another very important sign of an unsuspected iceflow to the N.N.W., in the frequent occurrence of Templepatrick rhyolite, the latter place lying some five and twenty miles S.S.E. We found rhyolites also at Ballymena, IV., near Cookstown Junction, IX., in boulder clay at Macedon, on the western shores of Strangford Lough, and away down at Newry, XXXIV.

Turning for a moment from the rhyolite fragments in Killagan eskers, let us read an extract from Mr. Maxwell Close's

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4. See Geology of Cork and Cork Harbour, Drift Memoir. Geol. Surv., 1905, p. 105, etc.

Also Proc. Roy. Dub. Soc., Vol. X., Part 2, p. 269 (1904). Pre-Glacial Raised Beach. W. B. Wright, B.A., and H. B. Muff, B.A., F.G.S.

famous paper on the Glaciation of Ireland,[5] dealing with that neighbourhood:—"About 3½ miles from Ballymoney, on the new road to Coleraine, at Seccaun Quarry, smoothings and striations, N.W. by W., were found by me on basalt. It was impossible to say in which direction the grinding agent moved along the lines. . . . Near Cullybackey at the distance of about ¾ of a mile on the road to Ballyconnelly Cross-roads, striations may be seen at a basalt quarry, N.N.W. Also on the same rock at the very cross-roads, 1½ mile S.W. of Cullybacky —a good example. These are parallel to the others, but it must be confessed they rather look as if the grinding movement were towards the N.N.W. This, however, I suppose, must be impossible." Writing to Mr. Close some three years ago, I mentioned our discovering rhyolites at Ballymena and Killagan, to which he replied:—"I am interested and pleased to know what you tell me of the northward movement of fragments of Templepatrick rhyolite, which confirms my reading of those striations to which you refer." This is the second time that our glacial researches have proved the remarkable acuteness of Mr. Close's reading of glacial striæ.[6]

Passing Ballymena, IV., we reach at Kilwaughter, V., and Gleno, VI., our only two localities where drift rests directly upon chalk, the former at an altitude of 500 feet, yielding only 3 Ailsa and 2 Bauxite erratics amongst a crowd of dolerite, basalt, and cretaceous fragments. Gleno at 300 feet being a totally different deposit, crowded at its base with Liassic fragments, its upper portion stratified, with unusually angular stones. Probably the basalt along this easterly coast has been stripped off the chalk by the impact of ice, as well as over Islandmagee, where magnificently glaciated surfaces of limestone are sometimes exposed in the quarry opposite Magheramorne ferry, and our members are familiar with the ice-ground

5. Notes on the General Glaciation of Ireland. By the Rev. Maxwell Close. Journ. Roy. Geol. Soc. Irel., Vol. I., Part 3, p. 215.
6. Note on "Glacial Geology of Kerry," by Miss Sydney M. Thompson. The Irish Naturalist, Vol. VIII., No. 3, p. 61, 1899.

layers of basalt capped by boulder clay in the less-exposed face of the great Magheramorne Quarry.

At Cloughfin, immediately north of Black Head, we have boulder clay resting on Trias about 50 feet above the open sea, and, as might be expected, we have a very varied series of erratics, including slate from Ballachulish, felsite from the Clyde, Cushendun, and Torr rocks, Ailsa rock, syenite from Slieve Gallion, ironstone nodules from Lough Neagh, granite from Slieve Croob, and three fragments of the porphyry dyke at Bloody Bridge, near Newcastle, nearly 50 miles south of Cloughfin.

Just inside the mouth of Belfast Lough, near Whitehead, we find an interesting difference in the list of erratics at Cloghanport; this deposit is only 4 or 5 miles from Cloughfin, but is much more limited in range. No rocks from south or west occur, Ailsa, Torr Head, and Cushendun furnishing the most distant boulders. Amongst the 339 erratics listed, 24 were from Ailsa Craig. We may group Ballyholme, near Bangor, with these two seaside localities, and note abundant pebbles of Ailsa and eight undoubtedly Scotch rocks, including a Silurian shale from Girvan, containing a fossil trilobite.

Retracing our steps inland to a group about Lough Neagh, with Drumsough IX. (near Cookstown Junction) and Cranfield Point, X., on its north, the glacial gravels of Antrim, XI., and Glenavy and Crumlin, XVII., on its eastern shore, we still find erratics from Cantyre, the Clyde, Cushendun, and Slieve Gallion, adding granites from Pomeroy in Co. Tyrone, as we descend eastward to Woodburn Glens, XII., anl arrive at Greenisland, where our survey first commenced its labours with such a surprising list of travelled rocks.

Once more we ascend the basaltic plateau, searching, at Mr. Wright's request, for the highest attainable boulder clays, visiting the great quarry behind Carnmoney Church, and extracting with difficulty the boulders unusually firmly bedded in the clay. Here we came upon chert, carboniferous limestones, and shales that have probably travelled 40 miles across the plateau from the Ballycastle coal-

fields. Subsequently we ascended the Cave Hill, and found a small deposit in the hollow behind M'Art's Fort, more than a thousand feet above the sea, containing erratics of flint and several foraminifera, but the loftiest record fell to Mr. Stewart, who discovered fossiliferous boulder clay between 1,300 and 1,400 feet on Divis Mountain![7]

In the recent geological survey memoir of the drifts around Belfast, published in 1904, we are told of Lake Belfast,[8] a vast expanse of fresh water, formed during the waning of the glacial period by flood waters from melting ice in the Lagan Valley, dammed back by a barrier of ice that still existed across the head of our present Lough. The waters of this lake escaped by the Dundonald Valley, emptying themselves into Strangford Lough. The gravel pit at Longhurst, XXVI., Neill's Hill, XXII., Morrison's Sandpit, XXIII., and other deposits of Dundonald Valley, XXIV., all belong to this late glacial period. Possibly these southerly floods bore along much floating ice, which may partially explain the occurrence of many rocks from the Mourne districts in the Belfast drifts, in the Dundonald sands and gravels, and along the wave-worn boulder clays of Strangford Lough, where they are mingled with granites from Pomeroy, Slieve Gallion, and Slieve Croob, rhyolite from Tardree and eurite from Annalong, one unique specimen embedded in boulder clay at Castle Espie, XXVIII., being identified by Mr. M'Henry as a primary conglomerate occurring in Cavan, Monaghan, and Armagh. We found Castle Espie limestone as an erratic southward as far as Killough, where our geological section held a pleasant Christmastide excursion in 1897. This Killough deposit of stiff boulder clay and conglomerate, partially turned to calcrete, occurs close to Silurian rocks, whose splendid glaciation disappears below the waves; yet no microzoa were found in the clay from this section, although the spray is

7. The Occurrence of Boulder Clay on Divis. Proc. B.N.F.C. (2), IV., p. 215 (1894-5).

8. The Geology of the Country Around Belfast. Mem. Geol. Surv. Irel. (1904), pp. 50, 62, etc

actually beating upon its face. Is it, perhaps, the deposit of more recent inland glaciers during the waning of the "West British ice," believed by Mr. Lamplugh to have reached its maximum earlier, and to have shrunk more rapidly than the Hibernian ice? Loose erratics at the foot of these clay cliffs included carboniferous limestone from Armagh, which lies almost due west, with sundry rocks from Slieve Croob and Slieve Gallion, confirming Mr. Close's observation of N.W. by westerly glacial movements in the Comber and Killyleagh districts. The geological survey memoir just alluded to mentions certain striæ running east and west in this district,[9] although the chief grinding movement seems to have been from N.N.W. to S.S.E. Mr. Kilroe believes these E. and W. striæ to denote an earlier ice movement from the east, but the absence of microza in Killough section seems to me almost a conclusive proof that it was not deposited by transmarine ice.

I referred before to the importance of examining drift deposits for marine organisms, and microzoa formed our chief reliance owing to the remarkable scarcity of shells in our N.E. drifts; they only occurred sparsely at 9 of our 36 localities. I once visited the celebrated glacial cliffs of Killiney, near Dublin, with Mr. Praeger, and easily collected more shell fragments in an hour than in seven years work round Belfast; a useful warning against conclusions drawn only from a single district.

The presence of stones bored by marine plants or animals is another test used to distinguish submarine deposits. Of these we only found two, one at Cloghanport and one at Greenisland.

The relative proportion of underlying rocks and erratics was another point recorded. Glacialists are well aware that in many drift deposits none of the subjacent rock occurs, although it may be found further on in the line of movement; also that in Eskers, which usually rest on boulder clay (frequently passing imperceptibly into it at their upper ends) erratics are usually carried further afield than in those contained in the boulder

9. Opus cit., p. 97.

clays upon which the Esker rests. Hence the value of these records. At Greenisland we counted 300 boulders, each 100 taken at random from a different level in the section: *all* were erratics, and the proportion in which they occured varied in a definite ratio for each level—100 at Castle Espie, similarly proved to be all erratic boulders. In the Black Mountain deposit, discovered by Mr. Bell, the only place I have seen in our district with distinct upper and lower boulder clays (the latter being so hard that hammer and chisel were required to extract its stones), 270 out of 274 were erratics; at Cloghanport 331 out of 339, with percentages at other localities varying down to 17 per cent. at Carnmoney and Bloody Bridge, XXXV. The latter has been considered a moraine deposit, and contained only a few travelled rocks, including a fragment of the porphyry dyke on the shore, 100 feet beneath, but no chalk nor flints were found in it.

Another point noted in our schedules is the frequent occurrence of some erratics and rarity of others. Of 107 varieties we found 26 at Dromore, XXXI., 27 at Ballyholme, 28 at Cloughfin, 33 at Newry, and 44 different rocks—almost 40 per cent. of the total list of rock varieties in the brickfields round Belfast, 10 out of 44 being isolated records of erratics, not as yet found elsewhere, showing the value of patient, persistent investigation, such as Mr. Bell devoted to them. Glacialists who may wish to study the matter more fully are referred to the tables accompanying this summary, and can examine our valuable list and collection of erratics at the Museum and the manuscript schedules with detailed descriptions of localities investigated.

When commencing work, we were frequently assured that we would never find erratics north of their place of origin. Our experience does not at all bear out this assertion, which postulates a simple, southward ice-flow, and omits to reckon with radiating local systems of glaciation that may have persisted over high ground prior to, and long after, the great central plain of Ireland and the Irish Sea were free from solid ice. A scrutiny of the tables giving the compass direction of

parent localities of definitely-recognised erratics shows a surprisingly frequent mixture of southern rocks, even in our most northerly districts.

In the drift memoir already referred to (p. 87) Mr. W. B. Wright suggests that our records of Mourne granite may be really due to the presence of a closely similar Arran rock found by him in drift on the basaltic plateau. Our Mourne erratics, however, include various dykes identified by Mr. M'Henry as Tertiary intrusions in the Mourne range, one of the most distinctive being a pink eurite which he locates near Annalong. This we found in many brickfields round Belfast, in several places in Dundonald Valley, and on the shores of Strangford Lough. Our S.S.W. record is a large composite block of grit and Slieve Croob granite, weighing about 9 tons, discovered by Miss Andrews and Mr. Stewart on Rough Island, near the northern extremity of Strangford Lough, 18 miles distant from its home.

In connection with this question of drift from the south, which suggests a gradual amelioration of the local climate, I must not omit referring to an ox skull and vertebra and fragments of wood found by Mr. Bell in apparently undisturbed boulder clay at Springfield brickyard in 1895, an inch and half of horn protruded from the clay seven feet below the surface. The fragments were submitted to Professor Haddon, F.R.S., and Mr. E. T. Newton, of Jermyn Street Museum.[10] Mr. Stewart and I subsequently visited the spot with Mr. Bell, and collected a bag of clay from the point where the bones were found, which was examined by Mr. Wright, but did not yield any marine organisms. When we recall the faunal conditions of Arctic regions in the present day, where the ice age still prevails, there seems no inherent impossibility in the coeval existence of animal life and many local icefields. Mr. Maxwell Close, Professor King, and many other geologists believed that the West of Ireland was relatively higher during the glacial

10. Proc. B.N.F.C. Report of Geol. Section. Miss Sydney M. Thompson (1895-6), p. 304.

period than at present, and its western shores conterminous with the 200-fathom line of sounding—a belief sanctioned by recent dredgings off our western coast on a muddy plateau, on whose margin rest many Donegal boulders close to the edge of the Atlantic abyss. A post-glacial elevation followed, indicated by the submerged peat round our shores, while glacial striæ and even eskers disappear beneath the waves of to-day. May we imagine these traces of land-ice and land-bogs to be contemporaneous during that post-glacial elevation, which some geologists consider was sufficiently great to connect Ireland with England, and permitted the re-peopling of our island by animals from the less severely glaciated sister land?

In compiling this summary of the Club's recent glacial work, I have felt strongly the lack of more thorough familiarity with similar work in other countries than is possible for those residing at a distance from great scientific libraries. When our work commenced in 1893, Ailsa erratics had been found for the first time in Ireland by Professor Cole, and we can still recall the warm interest excited by our first schedule handed in at the British Association meeting at Oxford in 1894, when its frequent occurrence in our drifts was mentioned. Ours was the first report ever received from Ireland by that Committee during its existence of fully 20 years. Our Club's Annual Proceedings have also furnished the Geological Survey with many useful data for their drift memoir, showing the value of careful local records, and the patient accumulation of details only possible to residents in a locality. The corresponding assistance rendered to local workers by such a memoir, which correlates our own observations with a wide experience of drift deposits in other parts of our islands is also inestimable.

We have proved the ubiquitousness of Ailsa rock, and the frequent occurrence of other Scotch erratics, whose presence at Belfast was noted by Messrs. Bryce and Hyndman in 1843.[11] We have established the unexpected occurrence of rocks many miles north of their parent locality, and traced many trains of

11. Report on the Geology of Londonderry, Tyrone, and Fermanagh. By J. E. Portlock, F.R.S. Appendix, p. 738.

erratics across the land; but some field work is still needed to connect distant records with our own neighbourhood.

Let us compare the north-westerly occurrence of Templepatrick rhyolite (see *ante*, p.324) and frequent chalk and flint from Malin to Inishowen Head, recorded by Mr. Close and Mr. Harte,[12] in conjunction with evidences of an ice-movement northwards of Inishowen Peninsula. Professor Carvill Lewis, when visiting Ireland in 1885 to compare British with American glaciation, wrote[13]:—"My ideas concerning glaciation have now been completely revolutionised. I came to Ireland, expecting to find it glaciated from the north. I find instead a complicated system of ice streams. A Scotch sheet invaded the eastern corner of Ireland, going down to Belfast. The ice-sheet of the interior radiated off in all directions." Again, when driving from Buncrana towards Malin, he describes "evidences of a great stream of ice moving north and east out of this valley. Slieve Snaght and the adjoining hills, together with this watershed, formed a great snowfield. Did the whole ice-sheet of Ireland move out on this watershed, or did it only drain a local snowfield? The watershed is 500 feet high." Mr. Close's N.N.W. ice-stream was moving to meet this one at Malin on the other side of the same watershed. Coupling these facts with the rarity of Ailsa rock west of the Bann and the proximity of the great Sperrin range of mountains, where Mr. Kilroe has recorded evidence of a glacial movement south-eastward,[14] seems to suggest a Sperrin ice-stream meeting the Scottish ice and a lobe diverging N.-west, bearing rhyolites and Ailsa with it. To ascertain the truth of this purely speculative hypothesis by investigating deposits between Killagan and Malin Head should be a fascinating bit of work. Although the main mass of the intruding ice moved southward, pressing on the Mourne mountains as it received fresh streams from the heights to the west of

12. On the Post-Tertiary Geology of Co. Donegal. By William Harte. Journ. Roy. Geol. Soc. Ireland, II., 30-67 (read 1867), 1871.
13. Glacial Geology of Great Britain and Ireland. By the late Henry Carvill Lewis, M.A., F.G.S. Longmans, Green & Co. (1894), p. 118.
14. Directions of Iceflow in the North of Ireland. T.I.G.S., XLIV., 827-833 (1888).

Lough Neagh, passing down the centre of Ireland, sending off side-currents into Carlingford Bay and north of Howth on its way, a minor stream probably reached Galway as suggested in Mr. Kilroe's paper, a supposition interestingly supported by the discovery by Mr. J. O. Campbell during our Club's visit in 1896 of an Antrim flint on one of the Aran Islands in Galway Bay. Mr. Kilroe informs me that Antrim flints have a good distribution westward, and he recently found one in coarse sandy alluvium in Co. Limerick, which must have travelled west in ice and down the Shannon valley, probably in river drift. In response to my mention of the N.N.W. rhyolite erratics he writes:—"All I have seen of the drifts since my original paper on the Ulster ice-flow has confirmed me in the opinion that there must have been an overwhelming flow . . . from Scotland over Ulster, and that this was followed by a flow northward and southward from Hall's axis of Irish distribution —perhaps N. by W. in Antrim, northward through Co. Derry, and N.N.E. through Donegal. I should not say that this northerly flow or any part of it constituted part of the overwhelming Scottish ice, though materials carried westward by the latter may have been subsequently carried northward and southward from the region indicated by Hall, extending from South Antrim to Galway." Our own observations incline me to question whether the Scottish ice swept westward over Donegal as Mr. Kilroe indicates, but these points are purely personal speculations to be refuted or confirmed by further investigation.

In conclusion I cannot speak too warmly of the fascination of erratic-hunting, and the triumphant joy of bringing home a handful of unfamiliar fragments; of many pleasant days spent in the open-air along the shore or on breezy hillsides, till the icefields of the past became living realities to us, and we almost seemed to share in their irresistible onward movement. Neither can I conclude without a grateful reference to the many undying friendships cemented by mutual tastes and mutual toil and study that will ever cluster round the memory of our pleasant Field Club Excursions!

Table showing at how many of the 36 localities entered on this list any given erratic occurred.

N.B.—The figures at the foot of each column only refer to this, and do *not* record how many specimens of any erratic were found at any locality. These important details are recorded in the Club's Manuscript Schedules. For instance, at Cloghanport (No. 8) 24 fragments of Ailsa rock were found, at Cloughfin (No. 7) 5 specimens of the Bloody Bridge Porphyry, and in brickfields round Belfast several specimens from Annalong, etc.

SCOTLAND.

	Dalbeattie Cruchlie	Clyde District. Slate	Red eurite	Diorite	Eurite	Pegmatite	Dark green felsite	Crinoidal Carb. limestone	Porphyrite	Oantyre or Clyde. Metamorphosed conglomerate	Felstone	Volcanic Breccia	Ailsa Craig. Riebeckite eurite	Ayr (Girvan). Pegmatite	Silurian fossiliferous sandstone	Calcareous band in Sil.
No. of specimen erratic in the Belfast Naturalists' Field Club collection.		101	158	1	47	129	87	59	40	A & B 20	131	136	51	13	107	36
Fair Head	1	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Ballyvoy and Calhame (Ballycastle)	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Killagan and Glarryford	3	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Ballymena	4	..	..	..	..	..	..	..	..	X	..	..	X	..	..	..
Kilwaughter (Larne)	5	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Glenoe (Glynn)	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cloughfin, N. of Black Head	7	X	..	X	..	..	X	..	..	..	..	..	..	..	..	..
Cloghanport, S. of Whitehead	8	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Drumsough (Ookstown Junction)	9	..	..	..	..	..	..	..	..	X	..	..	X	..	..	..
Cranfield Point (Lough Neagh N.)	10	..	..	..	..	..	..	..	..	X	..	..	X	..	..	..
Antrim Gravels (Antrim Section)	11	..	..	X	..	..	X	..	..	X	..	..	X	..	..	..
Woodburn Glens (Carrickfergus)	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Greenisland Railway Station	13	..	..	X	..	..	..	..	..	..	..	..	X	..	..	..
Quarry behind Carnmoney Church	14	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
M'Art's Fort, Cave Hill	15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballyholme (Bangor)	16	..	..	X	X	X	X	..	X	X	X	X	X	..	X	..
Crumlin and Glenavy (Lough Neagh, E.)	17	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Wolfhill and Ligoniel (Belfast)	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Divis Mountain	19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Black Mountain	20	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Brickfields, round	21	..	X	X	..	..	..	X	X	X	X	..	X	X	..	X
Neill's Hill	22	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Morrison's Sandpit (Dundonald)	23	..	..	X	..	..	..	..	..	X	..	..	X	..	..	..
Ballyroran and Carrowreagh	24	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Colin Glen	25	..	..	..	..	..	X	..	..	..	..	..	X	..	..	..
Longhurst (Dunmurry)	26	..	..	..	X	..	..	..	..	..	..	..	X	..	..	..
Island Hill and Rough Island, Strangford Lough	27	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Castle Espie	28	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..
Strangford Lough, S. of Gastle Espie	29	..	..	X	..	..	..	..	..	XB	..	..	X	..	..	..
Dungannon	30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dromore	31	..	..	..	..	..	..	..	..	X	..	..	X	..	..	..
Armagh	32	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Killough	33	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Newry	34	..	..	X	..	..	..	..	..	X	..	..	X	..	..	..
Bloody Bridge, S. of Newcastle	35	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kilkeel and Glasdrumman, S. of Newcastle)	36	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
		1	1	8	2	1	4	1	2	11	2	2	26	1	1	1

SCOTLAND OR IRELAND.

	Olyde, Oantyre, North Antrim or Down. Old Red Conglomerate	Light-green felsite	Quartz diorite	Old Red Sandstone	Carb. Chert	Quartzite	Carb. Conglomerate	Carb. Sandstone	Carb. fossiliferous shale	Porphyrite	Metamorphosed grit	Scotland or Tyrone. Epidote granite	Diorite	Syenite	Derry. Gneiss, Sliere Gallion or Croob	Foliated Gneiss	Eurite	Granite	Sootland or Down. Sil. and Ord. shales.	Granites	Silurian Flint	Granites
No. of specimen erratic in the Belfast Naturalists' Field Club collection.	143	94A	94B	114	48	79	80	37	103	102	53	2	91	118	.. 152	153	154	108	26 32	20 35	135	132 145
Fair Head	X	X	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballyvoy and Calhame (Ballycastle)	..	X	..	..	..	..	X	..	X	..	X	..	..	..	..	..	..	..	..	..	..	..
Killagan and Glarryford	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballymena	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kilwaughter (Larne)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Glenoe (Glynn)	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cloughfin, N. of Black Head	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	X	..	..	..
Cloghanport, S. of Whitehead	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Drumsough (Ookstown Junction)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..
Cranfield Point (Lough Neagh N.)	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	X	X	..	..	..	..
Antrim Gravels (Antrim Section)	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Woodburn Glens (Carrickfergus)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Greenisland Railway Station	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Quarry behind Carnmoney Church	..	..	..	..	X	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..
M'Art's Fort, Cave Hill	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	X	X	X	X
Ballyholme (Bangor)	X	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	X	X	X
Crumlin and Glenavy (Lough Neagh, E.)	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wolfhill and Ligoniel (Belfast)	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Divis Mountain	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Black Mountain	X	..	..	..	..	X	..	..	X	..	..	..	..	..	..	..	..	..	X	X	..	..
Brickfields, round	X	..	..	..	..	..	X	X	..	..	X	X	X	..	..	..	..	..	X	X	..	X
Neill's Hill	..	..	..	..	..	X	..	..	..	..	X	..	..	..	..	..	..	..	X	X	..	..
Morrison's Sandpit (Dundonald)	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X X	X	..	..
Ballyroran and Carrowreagh	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Colin Glen	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Longhurst (Dunmurry)	..	..	..	..	..	X	..	..	..	..	X	..	..	..	..	..	..	X	X	..	..	..
Island Hill and Rough Island, Strangford Lough	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	X	..	..	..
Castle Espie	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..
Strangford Lough, S. of Gastle Espie	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dungannon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Dromore	..	..	..	..	..	..	X	..	..	X	..	..	X	X	..	..	..	X	X	X	..	..
Armagh	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..
Killough	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	X	..	..	..
Newry	..	..	..	..	..	X	..	..	..	..	..	..	..	X	X	X	..	X	X	X	..	..
Bloody Bridge, S. of Newcastle	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	X	X	..	..
Kilkeel and Glasdrumman, S. of Newcastle)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	9	2	1	1	6	3	3	1	2	2	5	1	2	3	2	1	3	5	18	10	1	2

IRELAND.

	North Antrim. Mica schist	Pebbly quartzite	Felstone	Augen Gneiss, Murlough	Epidote rock, Torr	Red porphyry, Cushendun	Porphyrite, Cushendun	Metamorph. pebbly grit, Cushleake	Euritic, Tornamoney	Porphyrites (160. shore beds, Cushendall)	Metam. sediments	Red granite	North Antrim, Derry, or Tyrone. Granitic rock	Sericite schist	Amethyst quartzite	Granite	Amphibolite	Derry. Trias basal beds	Syenite, Sliere Gallion	Gneiss, Sliere Gallion	Tyrone. Epidote rock, N. of Pomeroy	Granite Pomeroy	Granite, Coalmoney	Calcareous sandstone
No. of specimen erratic in the Belfast Naturalists' Field Club collection.	36	74	134 144B	84	120	146 138 65	3	28	45	151 160 83	17	60	22A	66	90	4	110	81 70	169	169	166	121	42	148	170
Fair Head	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballyvoy and Calhame (Ballycastle)	..	..	..	..	..	X	..	X	X	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Killagan and Glarryford	X	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballymena	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kilwaughter (Larne)	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Glenoe (Glynn)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cloughfin, N. of Black Head	X	..	..	X	..	X	..	..	X	X	X	..	..	..	..	..	X	..	..	X	..	..	..	..	..
Cloghanport, S. of Whitehead	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Drumsough (Ookstown Junction)	X	X	..	..	..	X	..	..	..	..	X	..	..	..	..	..	X	..	..	X	..	..	..	X	..
Cranfield Point (Lough Neagh N.)	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..
Antrim Gravels (Antrim Section)	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Woodburn Glens (Carrickfergus)	..	..	..	..	..	X	..	..	X	..	..	..	..	X	..	X	..	..	X	..	..	..	..	..	..
Greenisland Railway Station	..	..	..	..	..	..	..	..	..	..	X	..	X	..	..	X	..	..	..	..	..	..	..	..	..
Quarry behind Carnmoney Church	X	..	X	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
M'Art's Fort, Cave Hill	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballyholme (Bangor)	..	..	..	X	..	X	X	..	X	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Crumlin and Glenavy (Lough Neagh, E.)	X	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	X	..	..	..
Wolfhill and Ligoniel (Belfast)	..	..	..	X	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Divis Mountain	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Black Mountain	X	..	..	..	..	..	..	..	..	X X	X	..	X	..	..	..	..	X	..	..	..	..	..	..	..
Brickfields, round	X	X	X	X	..	X X	X	..	X	X X	X	..	..	..	..	..	..	X	..	..	..	..	..	..	..
Neill's Hill	X	..	X	..	X	..	..	X	..	X	X	..	..	X	X	..	X	..	..	..	..	..	..	..	..
Morrison's Sandpit (Dundonald)	X	..	..	X	..	X	..	..	X	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballyroran and Carrowreagh	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Colin Glen	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Longhurst (Dunmurry)	X	..	X	..	..	X	..	..	X	..	X X	..	..	..	..	X	..	..	..	..	..	..	X	..	..
Island Hill and Rough Island, Strangford Lough	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Castle Espie	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Strangford Lough, S. of Gastle Espie	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..
Dungannon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dromore	X	..	..	..	..	X	..	..	X X	X	X	..	X	..	..	X	..	X	..	X	..	X	..	..	..
Armagh	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Killough	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	X	X	..	..	..	..	..
Newry	X	..	X	..	..	X	..	..	X	X	X	..	X	..	..	X	..	..	X	X	..	X	..	..	..
Bloody Bridge, S. of Newcastle	X	..	..	..	..	..	..	..	..	..	X	..	X	..	..	..	..	..	..	..	..	X	..	..	..
Kilkeel and Glasdrumman, S. of Newcastle)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	13	2	6	6	2	11	2	3	9	7	21		4	1	1	6	4	4	3	1	6	1	1	3	1

	MID AND SOUTH ANTRIM. Ironstone Nodules, Lough Neagh	Silicified wood, Lough Neagh	Rhyolites	Cretaceous	Flints	Lower Lias shales	Yellow Felsite	Diorite	Bauxite	DOWN. Magnesian limestone. Chalk dykes round coast	Mourne District. Dykes in granite, etc. Minette	Diorite	Felstone	Carb. limestone. Castle Espie	Granite, Sliere Croob	Granite rock. Sliere Croob (Magheradroll)	Porphyry, St. John's Point	Porphyrite	Mica syenite	Pitchstone	Grey eurite	Felstone	Porphyry, Bloody Bridge	Eurite. Annalong, etc.	Red granite	ARMAGH. Carb. limestone	Armagh, Monaghan, or Cavan. Conglomerate (Ballydovery?)
No. of specimen erratic in the Belfast Naturalists' Field Club collection.	8	59	9	15	27	92	49	16	57	150	167	100	44A	144	115	22B	165	117	105 00	113	140	109	30	128 139	43	9 144	25
Fair Head	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballyvoy and Calhame (Ballycastle)	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Killagan and Glarryford	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballymena	..	..	X	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kilwaughter (Larne)	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Glenoe (Glynn)	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cloughfin, N. of Black Head	X	..	..	X	..	..	X	..	..	..	..	..	..	X	..	X	..	..	..	X	X	X	..	..	..	..	..
Cloghanport, S. of Whitehead	..	..	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Drumsough (Ookstown Junction)	..	X	X	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cranfield Point (Lough Neagh N.)	X	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..
Antrim Gravels (Antrim Section)	..	..	X	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Woodburn Glens (Carrickfergus)	..	..	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Greenisland Railway Station	..	..	..	X	X	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Quarry behind Carnmoney Church	..	..	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
M'Art's Fort, Cave Hill	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballyholme (Bangor)	..	..	..	..	X	..	..	X	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	X	..	..	..
Crumlin and Glenavy (Lough Neagh, E.)	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wolfhill and Ligoniel (Belfast)	..	..	..	X	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Divis Mountain	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Black Mountain	..	..	..	X	X	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Brickfields, round	..	..	..	X	..	X	..	..	..	X	..	..	..	..	..	..	X	X	..	..	..	..	..	X	..	..	..
Neill's Hill	..	..	..	X	..	..	..	..	..	..	..	X	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..
Morrison's Sandpit (Dundonald)	..	..	..	X	X	X	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	X	..	..	..
Ballyroran and Carrowreagh	..	..	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Colin Glen	..	..	..	X	X	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..
Longhurst (Dunmurry)	..	..	..	X	X	..	..	..	..	..	..	..	X	..	..	..	..	X	..	..	..	..	..	X	..	..	..
Island Hill and Rough Island, Strangford Lough	..	..	..	X	X	..	..	..	..	..	..	..	..	..	X	X	..	..	..	X	..	..	..	..	..	..	..
Castle Espie	..	..	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X
Strangford Lough, S. of Gastle Espie	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..
Dungannon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dromore	..	..	..	X	X	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..
Armagh	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Killough	..	..	X	X	..	..	..	..	..	..	..	..	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..
Newry	X	X	X	X	..	..	..	..	..	..	..	..	..	..	X	..	..	X	..	..	..	..	..	..	..	X	..
Bloody Bridge, S. of Newcastle	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..
Kilkeel and Glasdrumman, S. of Newcastle)	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	4	1	0	22	21	4	2	2	2	1	1	2	3	1	4	2	1	1	6	1	1	2	2	4	1	3	1

	N.E. ULSTER. Micaceous sandstone	Felstone	Trias	Quartz	Basalt	Dolerite	Gypsum	Volcanic ash, etc.	Gabbro	Igneous rock, jasper	Garnet rock, dyke	Carb. Limestone	Carb. shale
No. of specimen erratic in the Belfast Naturalists' Field Club collection.	12	5	5	46	31	6	7	164 11	21	60	110	126	162	61
Fair Head	..	..	..	..	X	..	..	..	..	..	..	..	..	..
Ballyvoy and Calhame (Ballycastle)	..	..	..	..	..	X	..	..	X	..	..	..	..	..
Killagan and Glarryford	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Ballymena	..	X	..	X	X	X	..	..	..	..	..	..	..	..
Kilwaughter (Larne)	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Glenoe (Glynn)	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Cloughfin, N. of Black Head	..	..	..	..	..	X	..	..	..	..	..	..	..	X
Cloghanport, S. of Whitehead	..	..	X	X	X	X	..	..	..	..	..	..	..	..
Drumsough (Ookstown Junction)	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Cranfield Point (Lough Neagh N.)	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Antrim Gravels (Antrim Section)	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Woodburn Glens (Carrickfergus)	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Greenisland Railway Station	..	..	..	..	..	X	..	X	X	..	..	..	..	..
Quarry behind Carnmoney Church	X	..	X	..	..	X	..	..	..	..	..	..	X	..
M'Art's Fort, Cave Hill	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ballyholme (Bangor)	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Crumlin and Glenavy (Lough Neagh, E.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wolfhill and Ligoniel (Belfast)	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Divis Mountain	X	..	..	..	..	..	..	..	..	..	..	..	..	..
Black Mountain	X	..	X	X	..	X	..	..	..	..	..	..	..	..
Brickfields, round	X	X	..	..	..	X	..	X	..	..	..	..	X	..
Neill's Hill	..	..	..	X	X	..	..	..	X	..	..	..	..	..
Morrison's Sandpit (Dundonald)	X	..	X	..	X	X	..	..	..	..	..	..	..	..
Ballyroran and Carrowreagh	..	..	..	..	X	..	..	..	..	..	..	..	..	..
Colin Glen	X	X	..	X	X	..	..	..	..	..	..	..	..	..
Longhurst (Dunmurry)	..	..	X	..	..	..	..	..	..	..	..	..	..	..
Island Hill and Rough Island, Strangford Lough	..	..	..	X	..	X	..	..	..	..	..	..	..	..
Castle Espie	..	..	..	X	X	X	..	..	..	..	..	..	..	..
Strangford Lough, S. of Gastle Espie	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Dungannon	..	..	..	..	..	..	..	..	X	..	..	..	..	..
Dromore	X	..	X	..	X	X	..	..	..	..	X	..	..	..
Armagh	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Killough	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Newry	..	..	X	X	X	X	..	..	..	..	X	..	..

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No.	Club's MS S Schedules Reference No.	LOCALITY.	County.	Sheet 1 in. Map.	O. D.	Subjacent Rock.	Type of Drift.	Derived Fossils.	Shells.	Microzoa.	Relative Proportion of Erratics	Compass direction in which the parent rock of erratics lies, taken from the localities where such erratics were found. W.	W.N.W.	N.W.	N. N.W.	N.	N.N.E.	N.E.	E.N.E.	E.	E.S.E.	S.E.	S.S E.	S.	S S W.	S.W.	W.S.W.	No.
1	VI	Fair Head	Antrim	8	500-600	Dolerite	l s drift	..	..	..	7 counted, all erratics	.	..	..	..	..	..	..	..	1	..	2	..	..	..	..	..	1
2	XIV	Ballyvoy and Calhame (Ballycastle)	"	"	400-500	Metamorphic	b c. s, g	..	..	..	72 " 19 "	..	.	..	..	..	..	2	..	1	..	6	..	..	.	..	..	2
3	XLV	Killagan and Glarryford	"	19	300	Basalt	s and g	..	..	..		..	..	..	..	..	..	3	.	..	.	1	..	..	..	..	..	3
4	XXXIV	Ballymena	"	36	150	..	b c	..	..	..	129 " 53 "	..	..	..	..	2	..	2	..	..	..	..	..	..	.	..	..	4
5	XXXI	Kilwaughter (Larne)	"	20	825	Cretaceous	"	..	..	None	192 " 78 "	..	..	..	..	..	..	1	..	.	.	..	..	..	.	..	..	5
6	XVI	Glenc (Glynn)	"	21	387	"		Lias	..	..	93 " 83 "	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6
7	XIX	Cloughlio, N. of Blackhead	"	"	Sea level to 50	Trias	b c and l s drift	.	..	For	124 " 99 "	1	..	..	5	..	..	3	..	..	..	..	5	..	..	..	..	7
8	XXIX	Cloghmorport, S. of Whitehead	"	29	75	"	b c	Cret and Lias	Shells	"	339 " 331 "	..	..	..	1	..	..	1	..	.	.	..	..	..	..	..	.	8
9	XXII	Drumsough, near Cookstown Junction	"	28	200	Basalt	"	Fossil Wood	..	None	..	2	..	..	..	3	..	2	.	..	.	..	..	..	..	..	..	9
10	XX	Cranfield Point, N. shore, Lough Neagh	"	27	60	"	"	..	..	..		..	..	..	..	..	..	2	..	..	..	..	2	..	.	..	..	10
11	XXXIII	Antrim Gravels, near Antrim Station	"	28	100	Trias	s and g	..	..	..		..	..	..		2	..	4	..	.	.	..	.	..	.	..	..	11
12	VIII, X	Woodburn Glens, Carrickfergus	"	29	106-500	"	b c	Cret	Shells	For		.	..	3	..	2	..	..	.	..	..	..	..	..	..	..	..	12
13	I	Greenisland Station	"	28	140	"	b c, s and g	Carb, Lias, Cret	Frag, Shells	"	300 " all "	..	..	1	..	..	..	2	..	..	..	..	..	..	..	..	..	13
14	VII	Quarry behind Carmoney Church	"	29	450	Basalt	b c	Cret	..	"	100 " 17 "	..	..	..	1	3	.	2	..	..	.	..	..	..	.	..	.	14
15	XXVI	Cave Hill (McArt's Fort)	"	28	1,100	"	"	..	..	For and Ostra		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15
16	XII	Ballyholme, Bangor	Down	29	Sea level	Ordovician	b c, s, g	Sil	Frag. Shells	" "	100 " 45 "	..	..	..	1	5	..	.	..	..	..	1	..	1	..	..	..	16
17	XXXV	Crumlin and Glenavy, E. shore of Lough Neagh	Antrim	36	50-100	Basalt	b c	..	..	..		..	..	..	..	3	..	1	..	..	..	..	.	..	..	..	..	17
18	XXV	Wolfhill and Ligoniel, Belfast	"	"	800	"	"	Lias	..	For		..	..	..	..	2	..	..	.	..	..	..	..	..	..	..	..	18
19	XIII	Divis Mountain	"	"	1,300 to 1,400	"	b c, l s drift	..	..	For and Ostra	100 " 62 "	..		..	..	1	..	..	..	..	..	..	..	..	..	..	..	19
20	XVII	Black Mountain	"	"	500	Trias	b c	Cret	..	None	274 " 270 "	..	..	..	..	9	..	1	.	..	..	..	..	1	..	..	..	20
21	XV	Brickfields round Belfast	Antrim and Down	"	30-220	"	"	Sil, Carb, Lias, Cret	Shells (rare)	For (May, 1900)		..		..	..	31	3	8	3	..	..	..	..	4	..	..	..	21
22	IX	Neill's Hill	Down	37	100	"	b c. s, g	Cret	Frag, Shells	For	300 " 239 "	..	..	1	4	..	..	1	.	..	..	..	..	1	..	..	..	22
23	XXIV	Morrison's Sand Pit, Dundonald Station	"	"	150	"	"	Lias	"	"	100 " 97 "	..	..	1	6	3	..	1	..	..	..	..	..	3	..	..	..	23
24	IV, V	Ballyorm and Carrowreagh	"	"	200	"	b c	..	..	For (rare)	180 " 145 "	..	..	..	..	5	..	1	..	..	..	..	..	..	..	..	..	24
25	XXX	Colin Glen	Antrim	36	450	Lias	"	..	..	..	128 " 123 "	..	..	..	..	2	.	2	.	..	..	..	1	..	..	..	..	25
26	XXI	Longhurst, Dunmurry	"	"	150	Ordovician	c, s, g	..	..	..		..	..	1	..	5	..	2	..	.	..	1	..	2	..	..	..	26
27	X	Island IIIII and Rough Island. N.-W. shore of Strangford Lough	Down	37	Sea level	Trias	b c	..	..	..		..	..	..	2	..	1	..	..	..	..	..	..	..	1	..	..	27
28	II	Castle Espie	"	"	39	Carboniferous	"	Lias	Frag, shells	For	100 " all "	..	.	..	..	4	.	..	..	.	..	..	..	1	..	..	..	28
29	XLIV	W. shore of Strangford Lough	"	"	Sea level	Silurian	l s drift	Carb (Castle Espie)	..	..		.	1	..	3	..	2	..	..	..	..	..	..	..	..	..	1	29
30	XLII	Dungannon	Tyrone	35	201	Carboniferous	b c	..	..	..		..	..	..	..	..	..	..	.	..	..	..	..	..	..	..	..	30
31	XVIII	Dromore	Down	48	300	Silurian	"	..	..	For (very rare)	208 " 97 "	..	..	4	..	7	..	2	.	..	..	..	..	1	..	..	1	31
32	XXXVI	Armagh	Armagh	47	142	Carboniferous	"	..	..	..		..	..	..	..	..	..	1	.	..	..	..	..	..	..	..	..	32
33	XXVIII	Killough	Down	01	Sea level	Silurian	"	..	..	None		1	1	3	..	..	..	..	..	..	..	..	..	..	..	..	..	33
34	XXIII	Newry	"	60	90	Granite	"	..	..	"	103 " 93 "	..	..	..	3	10	1	2	..	..	..	..	..	..	..	..	..	34
35	III	Bloody Bridge, Newcastle	"	61	100	Silurian	s d	..	..	"	300 " 51 "	1	..	..	1	2	..	..	..	..	..	..	..	..	..	..	..	35
36	XXVII	Kilkeel and Glasdrumman, E. coast of County Down	"	71	Sea level and up to 55	"	b c, l s drift	..	..	..		..	..	..	..	.	.	1	..	..	..	..	..	..	..	..	..	36
											Total,	5	2	14	26	98	10	47	3	2		11	8	14	1		2	

ABBREVIATIONS:- Types of Drift.—l s d—loose, stoney drift; b c—boulder clay; s—sand; g—gravel.

Shells.—frag—fragmentary.

Microzoa.—For—foraminifera; Ostra—Ostracoda. Blanks indicating that the drifts of that locality have not yet been examined. "None"—that drifts were examined and none found

The relative proportion of erratics was ascertained from boulders of all sizes taken at random and counted.

The Compass direction is only given for erratics, whose parent rock is definitely ascertained, excluding rocks found *in situ* in more than one locality.

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THE CARNMONEY CHALCEDONY:

ITS OCCURRENCE AND ORIGIN.

(With a General Note on the Formation of "Secondary" Siliceous Minerals in Volcanic Lavas).

By JAMES STRACHAN.

Being an Appendix (No. 8 of Vol. II.) to the Proceedings of the Belfast Naturalists' Field Club, for 1905-6.

THE CARNMONEY CHALCEDONY, ITS OCCURRENCE AND ORIGIN, (WITH A GENERAL NOTE ON THE FORMATION OF "SECONDARY" SILICEOUS MINERALS IN VOLCANIC LAVAS).

BY JAMES STRACHAN.

1. Carnmoney Hill, with its steep escarpment sloping sharply towards the Belfast Lough, is a prominent and picturesque feature in the landscape of the country lying to the North of Belfast. The attention of the geologist is attracted both by the peculiar shape and the comparatively isolated position of this Hill, which represents the site of an ancient volcano, from whose throat, in Tertiary times, poured forth part of the Upper Basaltic Lava. On the south side of the hill, the denuded 'neck' or 'plug' of this old volcano may be traced, cutting through the Lower Basalt, the Cretaceous, and older strata. The Upper Basalt and part of the Lower have been removed by denudation, leaving the plugged-up vent, which is almost one quarter of a mile in diameter. The material of the neck is a vesicular lava similar in appearance to that of the doleritic dykes found in various parts of Co. Antrim. In a recent Survey Memoir, the following petrological analysis of this rock is given:—"Under the microscope the rock is a fairly coarsely crystalline dolerite, containing much magnetite in the form of opaque, black, and unaltered crystals. The chief constituents are pale brownish augites and fresh plagioclase laths (labradorite) intergrown ophitically with one another. There occurs also here and there in the sections a more compact or finely crystalline material of similar composition, but with a large proportion of glass. It is chiefly in this part that the mineral 'hullite' occurs as a brownish or greenish-brown translucent substance, somewhat like palagonite in appearance,

and more or less completely filling irregularly-shaped vesicles in the rock. The central greenish (chloritic) part is usually almost isotropic, and is surrounded by a zone of yellowish-brown material, with a fibrous structure and a radial arrangement of the component parts."

Professor Hull remarked that olivine was also present in the rock, but according to Professor Cole it is by no means an abundant constituent of the mass. There is no doubt, however, I think, that in some places the rock approaches the nature of an olivine-dolerite, and, that in such portions of the lava, zeolitic minerals are of more common occurrence than purely siliceous ones. To this analysis must also be added *iron pyrites*, which appears to be distributed in a very irregular fashion throughout the rock. On the whole, it is not a common constituent, but occasional fragments of the rock may be found containing at least five per cent. of the bright, brass-yellow crystals. In the main, we may freely accept Professor Cole's description and nomenclature of the rock as a basaltic-andesite, or allied to the pyroxene-andesites. Although coarser in crystalline structure, the basaltic-andesite of Carnmoney is nearly related to many of the Scottish andesites, which are compact rocks made up chiefly of labradorite, with a smaller proportion of augite, and without olivine; from these lavas are obtained the finest of the chalcedonies, known as 'Scotch pebbles.'

2. The Chalcedony of Carnmoney occurs in large cracks, or veins, in the rock. These are sometimes as much as twelve inches in width, and from this, the cavities thin away into a mere hair's-breadth. These veins have apparently been formed during the consolidation of the lava, for the vein-sides are coated, in all degrees of thickness from a mere film to one inch, with the mineral *hullite*, which has been described by Professor Cole as "the altered and hydrated glass of the original basaltic ground-mass." As the hot magma hardened, the cooling and crystallisation of the minerals caused mechanical contraction to take place, resulting in the formation of large cracks into which

the still fluent portion of the lava was secreted, coating the walls of such cavities with 'hullite.' This mineral must now be considered for a little, because its presence plays an important part in the structural arrangement of the Chalcedony, and perhaps in the deposition of the silica in that form. Hullite is a black pitch or waxy-like substance, passing in colour to yellow-brown and red-brown. It is soft (H—2 to 3) and extremely brittle, breaking with a smooth, slightly conchoidal fracture. In thin sections the black specimens show a greenish colour, but a good deal of the hullite in the cavities and veins is more yellowish-brown and reddish-brown in colour. This mineral has been described as mammillated and 'minutely stalactitic,' but 'minutely reniform' or 'minutely spherical' would be a better description, because the 'stalactites' of hullite, like those of chalcedony, have a fibrous structure, and seem to be 'animated by a kind of crystalline spinal energy.' Very rarely these spherical forms are slightly translucent, and by reflected light appear to glow with a fiery amber colour. The thicker deposits of hullite, coating the sides of the veins in which the chalcedony occurs, are often cracked and fractured, representing on a minute scale the larger cracks or veins of the mother-rock. These small cracks are filled up in the same fashion as the large veins, with chalcedony and other minerals. In chemical composition hullite varies, but it might be described as a basic mineral, composed of aluminium, iron, magnesium, and calcium silicates, containing about 39 per cent. of silica, and about 13 per cent. of 'water of hydration.' It has been placed mineralogically as 'near delessite,' but might be said to occupy a position between celadonite and chlorophæite, so far as chemical composition is concerned. All of these minerals, however, vary in their composition, and by some mineralogists are not regarded as definite species. The old-fashioned name of 'green earth' seems to be the best title for minerals of this class, although several are not 'green,' and a number not 'earthy.' Fifteen years previous to Professor Cole's investigation of hullite, the latter was carefully examined, for the first time, by E. T. Hardman and Professor Hull. Hardman came to the conclusion

that it was a secondary mineral, and classed it as a member of the chlorito-ferruginous group or green earths. As far back as the year 1837, however, Dr. Scouler described it as a 'pitch-stone,' or volcanic glass, and in 1843 General Portlock called it an 'obsidian.' It is of interest to trace the history of geological opinion concerning hullite from these earliest references to those of the present day. In the years 1837-1843, it was regarded as a volcanic glass, which had been exuded into the cavities as the lava cooled. About the year 1868 this opinion was upheld by G. V. du Noyer, but ten years later Hardman departed entirely from this view, as we have already stated, describing it as a secondary mineral of the green earth variety. In 1879, as Professor Cole has pointed out, Dr. Heddle, of St. Andrew's, supported Hardman in his claim for the retention of hullite as a definite mineral species. It is here worthy of notice, that Heddle's views concerning the *origin* of such 'green earths' underwent a complete change; in 1871 he regarded such minerals as contemporaneous with the last stages of cooling in the early history of the lavas in which they are found, whereas in his "Mineralogy of Scotland," written at a much later date, he describes the same minerals as decomposition products of the weathering lava. In the same year (1879) William Gault, of Belfast, took up this idea, that hullite was a 'secondary' mineral, and accounted for its origin by supposing that it was deposited, along with chalcedony and other siliceous minerals, from hot alkaline springs which arose in the volcanic neck 'long after the volcanic forces had spent their vigour.' The hot alkaline water acted on the rock sides and penetrated the ground of the rock, dissolving mineral matter from the mass, and re-depositing it in the gas-vesicles and veins. In 1885 hullite was again examined, on this occasion by Lacroix, who also determined it to be a secondary mineral related to the decomposition-products of olivine. Latterly, in 1895, Professor Cole reviewed the opinions of Hardman, Hull, Heddle, and Lacroix, and, setting aside the idea that hullite is a 'secondary mineral' at all, described it as 'a basic glass that has become soft and "gummy" by alteration.'

3. In considering the above interpretations of observed facts, we may class the theories for the origin of hullite into three distinct groups. These are:—

(1). The Igneous Theory (supported by Scouler, Portlock, and Du Noyer), that hullite is a glassy substance *like* 'pitchstone' or 'obsidian,' and was probably formed during the last stages of the rock's solidifying.

(2). The Mineral Theory (upheld by Hardman, Heddle, Gault, and Lacroix) that hullite is a 'secondary mineral' of the green earth group, and was probably formed during the decomposition of the rock, permeated by *meteoric* waters in the ordinary course of rock-weathering, or by hot alkaline waters of *telluric* origin, under special circumstances.

(3). The Altered-Glass Theory (presented by Professor Cole) that hullite is 'the altered and hydrated glass of the original basaltic ground-mass,' or 'a basic glass that has become soft and "gummy" by alteration;' it was formed in the first place by igneous fusion, but has suffered subsequent transforming changes.

There is no doubt whatever that Professor Cole is correct in his surmise as to the identity of the hullite lining the cavities of the rock, with the material of the ground-mass, but, with all due respect to his fine treatment of the subject, I am inclined to doubt that hullite was in the first place *simply* a volcanic glass; I believe that this substance was not only hydrous in its composition from the first, but that it has not undergone any extensive alteration since that time. In its original condition, and as still found in certain portions of the rock, the hullite might be more accurately described as a hydrous, waxy substance, intermediate in its nature between a volcanic glass and a green earth. Professor Cole compares the alteration of the original hullite to its present form, to the alteration of basaltic glass into a green "serpentinous" material; but, where the hullite is altered, I believe that the change is mostly a physical one, and only to a small extent chemical. The resemblance of

hullite to a chloritic mineral I regard as an original structure. It is closely related to the green earths, celadonite and chlorophæite, which form the 'skin' of many agates, and which originated in quite a different manner from the "serpentinous" green earths; the latter are decomposition-products, and the former are contemporaneous formations of the lava. Professor Cole compares the coating of hullite in the vesicles to 'lava-stalactites' on a small scale, 'the glassy matrix of the lava having oozed out under pressure into any cavities it could find;' but these 'stalacites' and spherical crusts of hullite possess a fibrous structure similar to the reniform or spherical growths of hæmatite and chalcedony, and I believe that the hullite was formed, to a great extent, under the guidance of active crystalline forces. The highly vesicular nature of the rock suggests the probability that that much water was present in the hot magma, and that the formation of the hullite was not purely an igneous action, but rather intermediate between igneous and hydro-thermal.

4. The extensive literature concerning hullite has rendered Carnmoney Neck historic in the annals of mineralogical geology, but of the chalcedony and other minerals found in the cavities of the rock, very little has been said or written. The Survey Memoir, for example, merely mentions the fact that 'a good deal of chalcedony occurs throughout the mass, and occasionally fills the vesicles.' Gault investigated the 'chalcedony and other siliceous minerals' generally, but did not give any detailed description of the type-vein containing them. The typical vein at Carnmoney consists of three distinct layers, or groups of layers, more or less intergrown, and representing three consecutive stages in the deposition of the mineral matter filling the vein. These are:—

(1). The Hullite Layer, consisting of hullite in varying degrees of thickness from a mere film to a crust, which is never more than an inch in measurement. The usual thickness of this mineral is one-sixteenth to one-eighth of an inch. The hullite coats the rock-sides, and was the first substance deposited in the vein.

(2). The Zeolitic and Calcitic Layer, deposited immediately on the surface of the hullite, consists of a thin layer, occasionally of fibrous zeolites, but generally composed of calcite. The usual thickness of this layer is about one-sixteenth to one-eighth of an inch, and it is mostly much weathered. The zeolitic parts of this layer appear to consist chiefly of natrolite, and occasionally this passes into analcime. Small crystals of chabazite are also to be found in this portion of the vein. The zeolites and calcite are rarely found together, but when they occur thus, the former have been deposited upon the latter. The thin layer of calcite frequently develops sporadic crystals of that mineral ½ to ¾ of an inch in length.

(3). The Chalcedonic Layer, coating the second layer, and sometimes entirely filling the central portion of the vein. After a single layer of chalcedony had been deposited, the large sporadic crystals of calcite again appeared here and there on its surface. These crystals in turn became enveloped by a second, and by succeeding layers of the chalcedony, and the finest examples of spherical crystalline growth may be found in the latter. In such instances, there is often in the chalcedony immediately investing the calcite crystals, a zone of white, opaque, jaspery material, containing calcareous and zeolitic matter.

The Carnmoney chalcedony exhibits all the typical structures of that mineral. In colour it varies from bluish-white to bluish-grey, the latter being more translucent than the whiter varieties. A beautiful translucent specimen, with typical reniform structure, was found to have a specific gravity of 2.582. A section through the reniform chalcedony shows very well its fibrous and spherically-crystalline arrangement. The chalcedony is almost entirely composed of these 'radiate-

acicular' fibres, but it also contains a small quantity of amorphous silica, perhaps opal. The fibrous structure becomes very apparent when a polished section is etched with hydrofluoric acid. In many instances the chalcedony passes into crystallised quartz, which has sometimes an amethystine colour. Small groups of crystallised iron pyrites occur sparingly on the surface of the chalcedony in some of the veins. Between the first and second layers of the chalcedony a very thin crust of a green earth, resembling chlorophæite, is sometimes found. The banded arrangement of the chalcedony, layer upon layer, parallel to the vein-sides, is often varied by onyx-layers of milk-opal and wax-opal, perfectly level and apparently formed under the influence of gravity. A variety of cacholong, composed of opal, with an admixture of zeolitic and chalcedonic-quartz fibres, is also found in the onyx-structures of the veins. Gault has pointed out that one kind of opal found at Carnmoney becomes very strongly phosphorescent when it is pressed against a revolving grindstone. Tribo-luminescence appears to be a marked characteristic of both chalcedony and opal. This phenomena is often observed by those who are accustomed to polish agates and other siliceous stones.

5. Mineralogical opinion on the mode of formation, or origin, of the various chalcedonies found in volcanic lavas is much divided, and on the whole, rather indefinite. One hundred years ago the early mineralogists regarded the chalcedony as a *contemporaneous* product of the lava in which it is found. To-day the general opinion, expressed in well-known text-books on geology and mineralogy, is that the chalcedony found in the cavities of volcanic lavas is a *decomposition-product* of the weathering and decomposing rock. For example, let us take the common variety of banded chalcedony known as 'agate' or 'Scotch pebble.' In the old days Jameson described agate as contemporaneous with the lava in which it is found embedded. In more recent times Heddle, who studied agate very carefully, came to the conclusion that it was purely a decomposition product formed in the ordinary course of rock-weathering. This view has been strongly upheld

during the last twenty years by J. G. Goodchild, and to-day we find a similar opinion in the fine text-book by Professor Miers.

Other writers, still pointing to rock-decomposition as the source of this 'secondary silica,' regard it as more or less a product of 'solfataric' action formed soon after the solidification of the lava. But even the standard text-books of geology are strangely indefinite in their remarks on this subject. The Carnmoney chalcedony is a very near relation to the agates found in the Scottish andesitic lavas, and bearing this in mind, we may express modern opinion as divided into two classes of theories concerning the origin of chalcedony in lavas. These are:—

(1). The Hydro-thermal or Solfataric Theory. This theory was applied to the Carnmoney chalcedony by Mr. Gault, who supposed that, long after the volcano has spent its forces, hot alkaline water was poured into the veins and percolated through the mass of the rock. These hot springs dissolved silica and other substances out of the rock-mass, and re-deposited them in the cavities and veins. He thus accounted for the origin, not only of the chalcedony, but also of the hullite and other minerals. Gault seems to have considered that a common origin must be sought to account for the formation of all the minerals found in the veins.

(2). The Epigenetic Theory. The theorists of this class hold that the chalcedony is a decomposition-product formed during the weathering of the mother rock. Rain-water falls upon the ground, and passing through the soil, which contains decaying vegetable matter, becomes charged with carbonic acid gas, and humic acid, which gives rise to carbonic acid. The dilute solutions of carbonic acid slowly percolate through the rock-mass, attacking the silicates, and become charged with carbonates of the alkalies and alkaline earths, and free silica. Labradorite, for example, loses sodium and calcium, which are removed as carbonates, and silica as silicic acid, leaving silicate of alumina behind in the form of clay. The calcium carbonate and silica are deposited in such cavities or veins as occur in the

rock, and the sodium carbonate is supposed to attack fresh silicates, setting free more silica.

Both of the above theories, it will be observed, depend upon the decomposition of the mother-rock for the supply of mineral matter deposited in the veins and vesicles. In the first case, the action of the hot alkaline waters, aided by carbonic and hydro-sulphuric acids, is supposed to have been a comparatively rapid one; while, in the second theory, the decomposition of the rock and deposition of the mineral matter in the cavities by the action of cold, slightly alkaline water, aided by carbonic and humic acids, is supposed to have extended over extremely long periods of time. G. Bischof calculated that it would require no less a time than 1,296,000 years to deposit one pound weight of amethystine quartz in this fashion.

6. It has been frequently pointed out that trap-rocks and lavas containing nodules and veins of chalcedony are for the most part much decomposed. In some cases they are completely weathered into a saponaceous green earth, from which the chalcedony may be dug out without trouble. Some geologists go so far as to say that the beauty of the chalcedonic concretions is in direct proportion to the amount of decomposition suffered by the mother-rock. I have not found this to be the case as a general rule. Agate and chalcedony in the unaltered rock are more difficult to get at, but such specimens are almost invariably much better than pieces from the weathered rock. Indeed, where the rock is very much decomposed, the chalcedony has also suffered changes, being cracked, stained, and 'devitrified.' This is the case at Carnmoney, for the finest specimens found there are extracted from the portions of the rock that have suffered the least from weathering influences. Many of the veins in this rock have suffered so much from percolating surface-waters that the zeolitic or calcitic layer has been entirely removed, and the chalcedony lost much of its native translucency. When such veins are broken open the chalcedony usually drops out because of the clear space between it and the rock-sides, and it is often found to be much weathered.

On the whole, I feel convinced that such deposits of chalcedony in volcanic lavas, and this one at Carnmoney in particular, are contemporaneous formations of the rock, and that they were formed during the last stages of the lava's cooling and drying. Furthermore, I am constrained to believe that the zeolitic or calcitic layer, and the siliceous contents of these veins and cavities, owe their origin, not to the decomposition of the mother-rock, but to the final process of its construction. In all probability the water present in the hot lava played an important part in the formation of these minerals. We may look upon this process of vein-filling in lavas as an example of the thorough economy so often exhibited in Nature. During the consolidation of the lava contraction took place, and the cracks or veins were formed. These were points of weakness in the rock—real wounds—and Nature immediately set about their healing. The residual magma—the very life-blood of the lava we might call it—was secreted into these rents, impelled more or less by physical forces, but, nevertheless, continually guided within itself by active crystalline energy. The hullite, calcite, zeolites, and chalcedony were deposited each in its order, and when the rock was cold and dry these minerals stood each in its place, and each ready to play its own part as a necessary portion of the solid earth. There is an unbroken sequence in the mineral matter from the main constituents of the lava to the chalcedony in the centre of the veins. Professor Cole has shewn that the hullite plays the part of a true groundmass in the intercrystalline spaces of the rock. Lacroix observed that the hullite has included in its formation minute crystals of felspar and magnetite; also small crystals of calcite. The calcite and zeolites follow upon the hullite, and finally the chalcedony, which in its growth has included crystals of calcite, and zeolitic matter.

7. That the calcitic or zeolitic layer of the veins is often much weathered I have already mentioned, and very often its former presence can only be inferred from the hollow pseudomorphous cavities in the chalcedony. This calcite has in some cases been re-deposited in other portions of the veins, and

occasionally minute tufts of zeolites may be found in similar positions. There is no doubt that cold, surface-waters, charged with carbonic acid, can remove calcium carbonate from the rock, and dissolve existing crystals of calcite, carrying away, in the form of bi-carbonate, considerable amounts of that mineral, and re-depositing it in other places. The formation of zeolites from felspar and from existing zeolites takes place in a similar manner, but to a much less extent; and the formation of chalcedony in this fashion appears to be a very rare occurrence. There is also no doubt that these reactions, resulting in the growth of calcite, hydrated silicates, and various forms of silica, would go on at a much faster rate, and to a much greater extent, if the cold meteoric waters were replaced by hot alkaline waters of telluric origin. These actions have their place in nature; but when we consider the molten magma from which certain lavas have been formed, containing water under immense pressure, and at a temperature far exceeding that of any solfataric water, we come to the conclusion that the residual waters of such magmas contained large quantities of silica, silicates, and carbonates in solution. As the temperature fell, the dissolved mineral matter would be secreted and deposited in the veins and cavities, in a definite sequence, according to the nature of the dissolved elements. It is natural that such secondary minerals should bear some chemical relation to the primary rock-forming minerals, because both are formed from the same magma.

The rock-forming minerals of the Carnmoney basaltic andesite are augite, labradorite felspar and magnetite. Augite is composed mainly of calcium, magnesium, aluminium, and iron silicates, the silica amounting to 47-48 per cent. In the hullite we find hydrous silicates of the same elements, iron being the preponderating element. When the water of hydration is omitted from the analysis the silica amounts to almost 46 per cent. The primary augite and magnetite have thus a secondary counterpart in the hullite. Labradorite is composed of aluminium, calcium, and sodium silicates; the silica amounting to 52-53 per cent. In natrolite (the most common zeolite in

this rock) we have a hydrous silicate of aluminium and sodium. When the water of hydration is omitted from the analysis the silica amounts to 52 per cent. The natrolite occasionally passes into analcime, which is a more acid, hydrous silicate of aluminium and sodium. In these zeolites the aluminium and sodium silicates of the felspar have a secondary representation, and the calcium silicate of that primary mineral has its secondary counterpart in the calcite and the free silica of the chalcedony.

8. From this point of view it is evident that we cannot draw the line very finely between the terms primary and secondary, if we regard the former as applied to minerals of igneous origin, and the latter as applied to minerals of aqueous (hydrothermal) origin. In the formation of such rocks, and the mineral contents of their veins, there is an unbroken sequence of action from igneous to hydro-thermal, and it is possible that a mineral might be formed by a process which is neither a purely igneous one nor purely an aqueous action. We see this in the case of hullite, which, from one point of view, has been described as a basic volcanic glass of igneous origin, and from another as a hydrous green earth of aqueous origin.

There is a certain amount of truth in each aspect, and the truth in both cannot be reconciled by regarding the hullite, on the one hand, as a volcanic glass altered to a green earth material, or, on the other, as a member of the green earth family derived by solution and decomposition from the primary minerals in the rock. It is more likely that from the beginning the hullite was by nature both a volcanic glass and a green earth. Mineralogists do not seem to have made a clear enough distinction between the two great sources of 'secondary' minerals in lavas—1st, deposition from the residual waters of the molten magma, and 2nd. deposition from percolating waters in the weathering rock. The action in both cases is an aqueous process, and, therefore, there is a great resemblance, often an identity, between the minerals formed in each way; but there is a difference in the time of formation and the quantities formed. The first action, at a high temperature, is rapid; the

second, at a low temperature, slow. By the first action such minerals as the zeolites, chalcedony, and opal are deposited in large quantities, whereas by the second action these substances are formed in comparatively small amounts. By the second process calcium and magnesium carbonates are often deposited extensively, because of their easy solubility as bi-carbonates in cold, meteoric waters, but the deposits of the same minerals from the hot residual waters of the cooling lava are often still more extensive. In the case of the 'green earths,' we find that minerals of this class, which are composed of the *extremely insoluble* silicates of aluminium, iron, and magnesium with varying quantities of the alkaline silicates, are usually the first substances deposited from the hot, residual waters of the lava. They are found almost invariably coating the rock-sides of veins and vesicular cavities of volcanic rocks. Such deposits are not extensive, because of the insolubility of these silicates. On the other hand, we find vast deposits of "serpentinous" and saponaceous green earths formed by the decomposition of certain lavas. In some cases the whole rock has weathered to a green earth. This substance consists chiefly of the above-mentioned insoluble silicates, with small quantities of the alkaline silicates held chemically-bound in the form of insoluble double silicates, and is really the residue of the rock, the more soluble substances having been removed by acid meteoric waters in the course of weathering. This course is a slow one, and most of the mineral matter thus removed is carried away in spring and river waters. Re-deposition on a large scale is rare in such rocks. When a volcanic rock has suffered from solfataric action, or hydro-thermal metamorphism, such green earths are also formed, not only as residues through the removal of the more soluble elements in the rock, but, also where the latter are re-deposited there is often a re-deposition of the green earths in smaller quantities.

9. The deposition of mineral matter from the residual waters of volcanic magmas, which we have regarded as the source of the Carnmoney chalcedony, accounts for the formation of the main masses of 'secondary' siliceous minerals in the veins

and cavities of most volcanic lavas. We have, for example, the zeolites in the basalts and dolerites, the agates and chalcedonies in the andesites and trap-rocks, and also the opals and hyalites in rocks of acid composition, such as rhyolites.

In describing the formation of the deposits in the typical Carnmoney vein, I have chosen them as a type of such for two reasons; firstly, because, as already explained, they exhibit clearly the continuity between the igneous formation of the mother-rock and the aqueous formation (hydro-thermal) of the contained secondary minerals, and, secondly, because, as I now briefly mention, they show, in beautiful sequence, the law of order in the separation of secondary minerals in such lavas. This law may be expressed in the following terms:—With the fall of temperature in the residual waters of cooling volcanic lavas there is a sequence of separation in the 'secondary' minerals deposited from such waters in the veins and cavities of the rock. These minerals fall into three groups which are deposited in the following order:—1st. Hydrous Earthy Silicates, and Oxides (including the green earths, such as Celadonite, Hullite, Chlorophæite, Delessite, etc., and the Oxides of Iron and Manganese); 2nd. Hydrous Crystalline Silicates and Carbonates (including the Zeolite family, and the Carbonates of Manganese, Iron, Magnesium, and Calcium); and 3rd, Crystalline and Hydrous Silica (including Quartz, Chalcedony, Hyalite, and Opal). These three groups are frequently intergrown, and often one, or two, of the groups are not represented at all.

The typical Carnmoney vein exhibits all the three groups distinctly, and is, on that account, a good type and example of such formations. As further examples of the working of this law, I shall now, in conclusion, mention the formation of several Scottish deposits of chalcedony. The most common type of chalcedony in the Scottish lavas is the agate with its wonderful and varied formations. In this case the outer layer is of green earth, and is generally composed of celadonite (or *celedonite)*, chlorophæite or saponite. Upon this we find the second layer, which is occasionally of calcite, but commonly of the zeolites, natrolite, and heulandite. The central portion of the cavity,

forming the third layer, is the agate proper, which is composed of chalcedony (of many colours), 'white agate,' cacholong, opal, and crystalline quartz (usually amethyst), arranged in concentric or level bands according to the nature of the siliceous material. The intergrowth of the green earth with the chalcedony produces the well-known moss-agates; and of iron-oxide with the chalcedony produces the equally beautiful jaspers, with their stellar, flammate, and pseudo-brecciate crystallisations. At Hillend, on the Pentland Hills (near Edinburgh) an interesting variation of agate-building occurs in the cavities of an andesite. The usual green-earth layer is present; in this case of celadonite and saponite, and as a second layer, in place of the zeolites, is a deposit of dolomite, in a beautiful ramifying form, covered by calcite, and within the latter is the third layer of chalcedony (carnelian). A similar sequence of deposition is found in the agates of Monzie (near Crieff, in Perthshire), described by Mr. Kerr as 'amœboid' agates. In this case the green earth is not found at all, but its place is taken by a layer of iron oxide, upon which the second layer of pearlspar has been deposited. Within the pearlspar or dolomite is found the third deposit of siliceous substance, constituting the agate of banded structure, with various layers of chalcedony, quartz, etc. Mr. Kerr suggests that these nodules have grown from the centre to the exterior, and from within rather than from without; but there is little doubt, I think, that these growths have been formed according to the sequence laid down in the above-mentioned law, and that the 'hollow spherical depressions' on the exterior of the Monzie type of agate, revealed by the weathering, or etching away of the exterior layers of iron oxide and pearlspar, are exactly analogous to the hollow pseudomorphous cavities on the exterior of the Carnmoney chalcedony.

DESCRIPTION OF PLATE.

Figure I.—Typical specimen of chalcedony from Carnmoney Neck, showing the characteristic reniform or spherical crystallisation of the mineral; the section through the spherical concretion to the right shows the central crystal of calcite invested by a zone of white zeolitic chalcedony.

Figure II.—Exterior surface of chalcedony from Carnmoney, showing the hollow pseudomorphous cavities formerly occupied by calcite and zeolites.

Figure III.—Typical vein of banded chalcedony from Carnmoney, showing a portion of the rock with the usual thin layer of calcite and hullite between the former and the latter. This structure is most clearly seen, where a small quantity of hullite is almost completely surrounded by the chalcedony. The thin white layer between the dark hullite and the chalcedony is composed of calcite.

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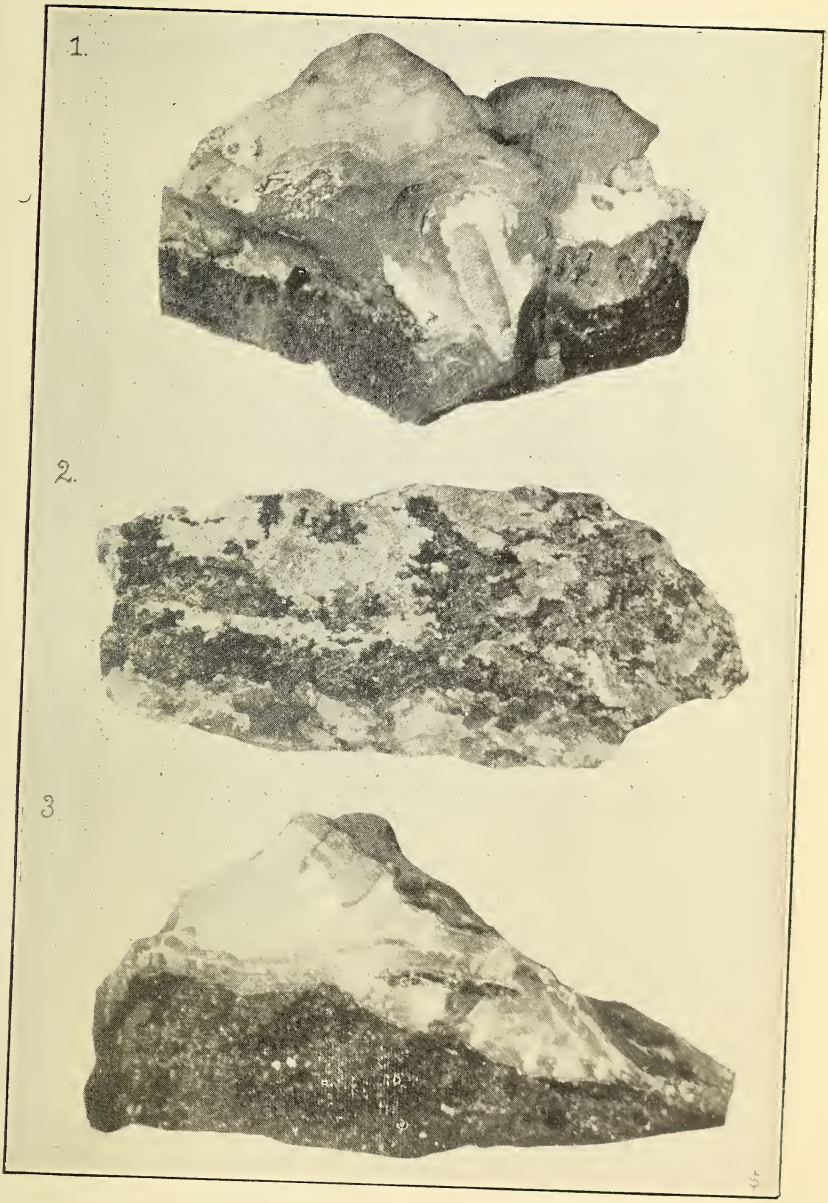

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SPECIMENS OF CARNMONEY CHALCEDONY.

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